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LATEST TYPE OF THE MAXIM MACHINE GUN.

It will be remembered that Mr. Henry M. Stanley was compelled, a short time ago, to abandon his lecturing tour through this country, and was recalled to take command of an expedition in relief of Emin Pasha, the successor of General Gordon, who is at present supposed to be beleaguered by hostile Africans near Wadelai, not far from Lake Albert Nyanza. Before leaving England he provided himself with one of Mr. Hiram S. Maxim's automatic machine guns, and the illustration, which is taken from a photograph, represents the great explorer in the act of firing the gun, while our compatriot, the inventor, is standing immediately behind the gun.

The gun made for Mr. Stanley weighs 40 pounds, the swivel on which it is mounted weighs 16 pounds, the tripod without the shield weighs 50 pounds, and the shield weighs 50 pounds. The gun may be detached from the tripod, which may be folded with the greatest facility. The seat slides back, drawing the strut with it, and the whole thing folds up. The tripod is different from the type illustrated in this paper in issue of December 13, 1884, being constructed for this particular service.

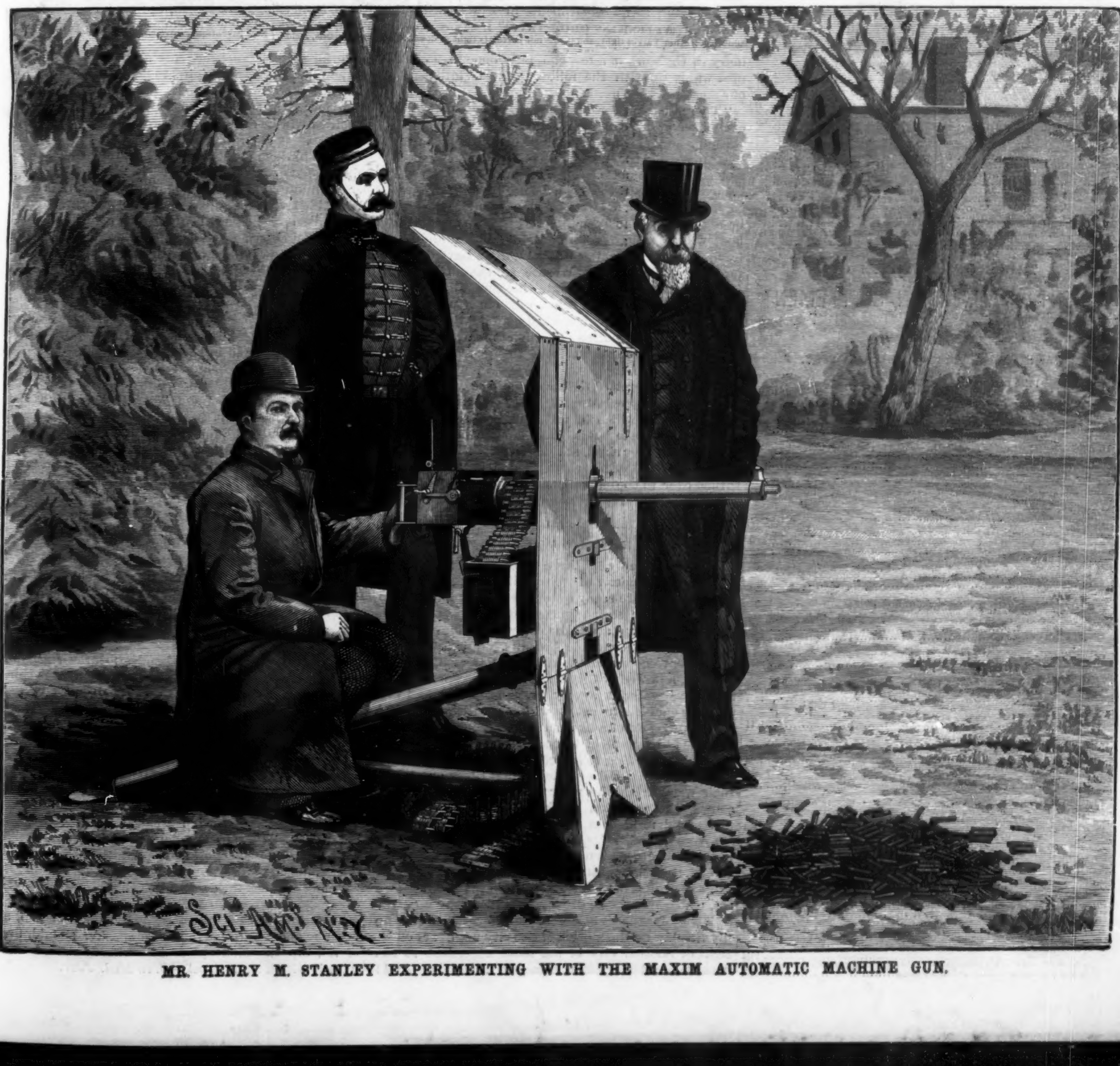
The action of the gun is automatic, each cartridge being discharged by the recoil of the shot preceding. The cartridges are placed in a belt, and the empty shells are thrown out in front of the gun, as shown in the photograph. The rate of fire is about 600 times a minute. With the shorter and smaller cartridges, such as are used in the U. S. army, the rate of firing would be about 700 shots a minute. The rapidity of the fire is such that at a thousand yards range twenty bullets will strike the target after the gun ceases to fire, while by giving the gun a very high elevation, five hundred rounds may be discharged before the first bullet strikes the ground.

To prevent too great heating a water tank is provided, from which the water is fed through the casing around the barrel. The amount of heat thus generated is about 1¼ units for each discharge, and a thousand rounds will evaporate more than a pint of water.

The gun is mounted pivotally, to admit of considerable latitude of range, and it may be turned very readily in any direction. The shield in the illustration is raised as a protection against arrows and spears. The top and bottom hinged sections may be lowered and raised, however, to provide a double thickness against bullets.

Casting Steel Forts.

Sir Henry Bessemer proposes to obviate the enormous expense of ordinary armor plates for forts by casting *in situ* the whole face of a fort or complete turret in one solid piece of steel, with all its ports and loop-holes properly shaped and formed in the act of casting. He says: "Let us take as a simple example the production of a fort with a curved face 100 ft. in length, 16 ft. high, and 3 ft. in thickness. Such a plate would be moulded after the manner practiced in ordinary iron foundries, that is, with brick walls held together with iron binders and internally lined with fire clay. Alongside this mould would be placed the melting cupolas and four fixed 20 ton Bessemer converters, each capable of turning out eighteen charges per day of twenty-four hours, thus delivering into the mould one ton of molten steel a minute. At this rate of working, the mould would be filled in sixteen hours, and produce a single plate weighing 960 tons, requiring no backing or superstructure for its support, and no expensive fitting together of separate parts. The static pressure in the mould tending to bust it open would, in this system of slowly filling the mould, be extremely small, owing to the fact that the metal will solidify at the lower part, leaving only half a foot or so fluid at the upper part. It will be equally obvious that it would be quite impossible to destroy such masses of steel as could be produced by this method by any existing artillery, while the price which such castings would cost at a time when we can purchase finished steel rails for £3 15s. per ton will be readily understood."



MR. HENRY M. STANLEY EXPERIMENTING WITH THE MAXIM AUTOMATIC MACHINE GUN.

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NEW YORK, SATURDAY, MARCH 5, 1887.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 588.

For the Week Ending March 5, 1887.

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COAST DEFENSES.

The report recently made on heavy guns and other material for coast defense, by a committee of the House of Representatives, furnishes additional proof that even intelligence and honesty, if not properly informed, may be led into error.

The reasons of the committee for its refusal to sanction the giving of contracts for the heavier caliber guns will find commendation among the judicious and informed. When we have shown our ability to make six and eight inch guns of the new pattern with dispatch and certainty, it will be time enough to undertake the far more difficult construction of twelve and fifteen inch guns; whereas, to begin without experience upon these monsters would, like enough, prove a waste of both time and money.

When the committee discusses the steel *vs.* iron question, its information seems meager and its logic untenable. Here are its own words:

"It may be asked why the amount appropriated is so small, and why no provision is made for a still larger gun, and why the appropriation is restricted to steel and excludes cast iron? The answer of the committee to these interrogatories may be briefly stated. Steel was selected because the committee believe it to be much the best material for large guns, as proven by actual test, and it would seem to be a manifest truth to the ordinary mind from common observation."

These answers, besides that they are "briefly stated," are, we fear, incorrect.

It has hardly been "proved by actual test," nor is it "manifest to the ordinary mind," that steel is "much the best material for large guns."

So far as cast iron guns are concerned, as has already been pointed out in these columns, they have stood a test fully three times as great as it has been thought advisable to subject steel guns of the same caliber to, and have been fired hundreds of rounds under a pressure of nearly seventeen tons to the square inch of bore.

The committee suggests an appropriation for mortars. The importance of mortars—rifled mortars of the new type for coast defense—can hardly be overestimated; for, if the experiments in France with the new French monster mortar have not been exaggerated, it is peculiarly adapted as a powerful auxiliary to the work of a torpedo boat defense. The report winds up with the following lucid statement of our most pressing needs:

"There is no harbor defense, in the judgment of this committee, that can be reached so quickly and so cheaply, nor which can be made more complete, than that made by the use of torpedoes, torpedo boats, and submarine mines. The sole protection necessary to cover and guard them can be improvised with great ease, when we have guns and men who know how to handle them. The dynamite torpedo upon a torpedo boat will, ere long, revolutionize all opinions and plans for harbor defense, unless this committee have failed in forecasting the future. We are so sanguine in our judgment that we appropriate this sum to give assurance to the inventive genius now studying the torpedo system and the use of dynamite therein that, upon the consummation of their plans, they may readily expect recognition from this government in a substantial form."

It is to be regretted that a committee which shows such a just appreciation of what is most required for harbor defense, which, in fact, admits in set terms that torpedoes, torpedo boats, and submarine mines are most urgently required, should suggest the appropriation of only $600,000 for them, as against millions to be turned over to the circumlocution office to start a wild goose chase for high power steel guns that will not burst.

An Extensive Water Supply.

The water supply for large cities or groups of cities is becoming a matter of serious difficulty all over the world. There are many questions involved, and sometimes there are so many conflicting rights that, no matter what steps are taken, they seem inevitably to lead toward interminable lawsuits. It is interesting, therefore, to note that the cities of Paterson, Raritan, Newark, and Jersey City have a fair prospect of getting pure water at a very reasonable cost, and that they are enabled to get it without outlay of capital. By the payment of a fixed sum per million gallons, the water is to be supplied to each city in its own service reservoir, according to its needs. At present, the cities below the Great Falls of the Passaic River are taking their water from the river by pumping works. Of course, the pollution of the river by the cities, factories, and residences on its banks renders the water far from desirable for drinking and cooking use, and many plans have been proposed to secure better water. One of the chief obstacles to the adoption of any of these plans has been the vested rights of riparian owners, who could not be dispossessed except by an action at law under the right of eminent domain. But to apply this law on the motion of one city might cut off the right of another city in the same watershed to condemn the water rights necessary to its supply. And it is certain that if Jersey City took steps to control the water of the upper Passaic, she would meet the opposition of not only the owners whose rights would be at stake, but also of Newark and Paterson, who might thereby find themselves deprived of their natural supply of water. Among so many conflicting interests, it would be very uncertain whether eminent domain would be a sufficiently potent rod with which to smite the rock.

But while the interested municipalities have been thus hampered, a way seems to have been opened on different lines. A company, known as the West Milford Water Company, was formed expressly to secure the right to sufficient water above the Great Falls to supply the population below that point for many years to come. The Society for the Encouragement of Useful Manufactures, of Paterson, chartered in 1791, owned the perpetual right of using the water of the Pasaic River above the Great Falls. This society is under contract to supply water to many manufacturers, and any interference with the water by proceedings under eminent domain would entail the payment of enormous damages when the condemnation should be made. But the society was not averse to parting with the right to use the surplus water, and this right was bought by the West Milford Water Company. Here, therefore, was provision for many millions of gallons of pure water during the greater part of the year. But, as there is a period of low water in summer, lasting generally about two months, further provision was necessary. Lying up in the hills of northern New Jersey are several ponds or small lakes, whose water is very pure. The West Milford Water Company selected several of these, carefully surveyed the land, and bought the land completely surrounding these ponds. The chief of these in importance was Dunker Pond, near the New York, Susquehanna and Western Railroad. It lies in a deep gorge, across which it is proposed to build a dam about 100 ft. long and 50 ft. high. The water will then be backed up to a depth of 35 ft. over an area of about 600 acres.

Another large reservoir will be formed at Macopin Pond. Other sources of supply secured were at Oak Ridge, Montville, Great Notch, Splitrock Pond, Hauk's Pond, and the overflow of Pequannock and Rockaway Rivers.

All the titles have been carefully settled, and the company has no hostile rights to fight. It proposes to build all the dams, aqueducts, gates, pipe lines, and other means of storage and supply, so that none of the cities will be called upon to raise or expend money for works. It is proposed to sell water to the cities, delivered to them in their service reservoirs, at less than thirty dollars per million gallons, less than three mills per one hundred gallons. The height of the reservoirs above tide level is so great that the water would rise far above any height at which it would be needed. The present cost of pumping and interest on the plant in Newark now amounts, with insufficient head, to about thirty-five dollars per million gallons.

The great interest to engineers in this matter will be the construction of the dams, aqueducts, and pipe lines, the system being practically equivalent to associating and consolidating the chief sources of water supply in a large and important watershed.

De Bange Guns.

A series of experimental trials with these guns has just been going on at Christiania, Norway, before a special committee, and the results are so satisfactory that the important question De Bange *versus* Krupp has, no doubt, been definitely decided in favor of the former, as far as Norway is concerned. The guns have a caliber of 8·4 centimeters, and the number of shots fired, amounting to 1,000, have not effected the smallest trace of extension, the diameter measured before and after the 1,000 shots agreeing to a hundredth part of a millimeter. The accuracy and the range of the firing have also been entirely satisfactory. Some minor drawbacks in connection with the gun carriages and the regulating screws, both of which suffered somewhat from the powerful recoil, have been removed, and those now used have stood the last 600 rounds without the least hitch. De Bange's obturator packing—consisting of two-thirds asbestos and one-third sheep's tallow, covered with sailcloth—has also proved most effective, although quick series of thirty, forty, and even fifty shots have been fired without cleaning the barrel or other parts.

The Telephone as a Source of Infection.

At a meeting of the Caucasian Medical Society, Dr. A. P. Astvatzaturoff, of Tiflis, drew attention ("Proceedings of the Caucasian Medical Society," November 17, 1886, p. 263) to the danger of infection arising from the promiscuous use of the mouthpieces of public telephones. To prevent any accident of the kind, he recommends that the mouthpiece should be disinfected every time after or, still better, before it is used. In other words, some disinfectant fluid should be kept at every telephone station, and the speaker should, first of all, dip the mouthpiece into the fluid, and then wipe it with a clean towel.—*Brit. Med. Jour.*

On the Explosion of Meteorites.

We have received from M. Hirn a *tirage a part* of a communication to *L'Astronomie*, in which he discusses the various phenomena accompanying the explosion of meteorites, with a view to explaining their causes.

M. Daubree, a long time ago, pointed out how very striking and difficult of explanation the noises are which are often heard in connection with the passage of meteorites, and called in question the explanation which had been given of their being really due to a veritable explosion.

M. Hirn, in his paper, begins by considering the causes which are at work in the production of the thunder which accompanies electric discharges, and of this he writes as follows: "The sound which we call thunder is due, as everybody knows, to the fact that the air traversed by an electric spark, that is, a flash of lightning, is suddenly raised to a very high temperature, and has its volume, moreover, considerably increased. The column of gas thus suddenly heated and expanded is sometimes several miles long; as the duration of the flash is not even a millionth of a second, it follows that the noise bursts forth at once from the whole column; but for an observer in any one place it commences where the lightning is at the least distance. In precise terms, the beginning of the thunder clap gives us the minimum distance of the lightning; and the length of the thunder clap gives us the length of the column. It must be remarked that when a flash of lightning strikes the ground, it is not necessarily from the place struck that the first noise is heard." M. Hirn then gives an interesting case which proves the truth of this remark. He next points out that a bullet whistles in traversing the air, so that we can to a certain extent follow its flight. The same thing happens with a falling meteorite just before striking the earth. The noise actually heard has been compared to the flight of wild geese or the sound produced when one tears linen. It is due to the fact that the air rapidly pushed on one side in front of the projectile, whether bullet or meteorite, quickly rushes back to fill the gap left in the rear.

The most rapid cannon shots scarcely attain a velocity of 600 meters a second (over 1,500 miles per hour), while meteorites penetrate the air with a velocity of 40,000 or even 60,000 meters per second; and this increased velocity gives rise to phenomena which, although insignificant where cannon shots are in question, become very intense and important when we consider the case of the meteorite. With that velocity the air is at once raised to a temperature of from 4,000° to 6,000° C. The matter on the surface of the meteorite will be torn away by the violence of the gaseous friction produced, and will be vaporized at the same time by the heat. This is undoubtedly the origin of the smoke which meteorites leave trailing behind them.

We have, then, precisely as in the case of lightning, a long narrow column of air, which is expanded, not so instantaneously certainly as by lightning, but at all events in an extremely short time and through a great length. Under these circumstances we should have an explosion in one case as in the other—a clap of thunder followed by a rolling noise more or less prolonged. If a cannon ball could have imparted to it a velocity of 100,000 meters per second (nearly two hundred and fifty thousand miles per hour), it would no longer whistle, it would thunder, and at the same time it would produce a flash, as of lightning, and would be instantly burnt up. M. Hirn depends upon this line of reasoning to show that meteoric thunder need not necessarily have anything to do with an actual explosion. He then points out that the intensity of the noise produced in every point of its trajectory depends, first, on the height; second, on the velocity of the meteorite; third, on its size; and fourth, on the configuration of the country over which it passes. He refers to the observation of Saussure that a pistol fired at a height of 5,000 meters makes very little noise. He then points out that at a height of 100,000 meters the density of the air is reduced to the small value of 0·000,000,004 krg.; the temperature being supposed to be —200° C. In such a medium as this a meteorite could produce no sound, although it might give out a very brilliant light, because its temperature and light depend, not on the absolute value, but on the rapid change of density.—*Nature.*

A New Theory of Boiler Explosions.

M. Hochereau, formerly a works manager in Belgium, has recently published a curious theory of what he calls fulminating explosions of steam boilers. He attempts to demonstrate that these fulminating explosions are to be attributed principally, if not exclusively, to th. ignition by an electric spark of a mixture of air and more or less highly carbureted gas produced in the boiler. For this it is necessary to establish three points: First, the possibility of an electric spark in the normal conditions of working boilers; secondly, the production of a more or less pure hydrocarbon gas; thirdly, the presence of the air necessary for the formation of an explosive mixture.

As to the formation of an electric spark, it is known that electricity is generated from the friction of steam escaping from narrow orifices; and M. Hochereau says he has witnessed the appearance of sparks when steam has escaped from a crack in a plate. He declares also that if the steam escaping from the safety valve of a boiler is observed in the dark, under favorable conditions, an electric aureole of 0·20 or 0·30 meter in diameter may be perceived round the valve. The spark is also produced when the steam valve is opened, as well as at the opening of the slide valve of an engine. Then the presence of hydrogen, more or less carbureted, is ascribed to the decomposition of organic matters, especially of a fatty nature, which find their way into the feed water, particularly when condensed water is returned to the boiler. Finally, the necessary air is supposed to be derived from that dissolved in the water and given off when it is vaporized. It is a fanciful theory, and requires verification.

Nazography.

La Science en Famille says that a new journal is soon to appear as the organ of the science of "nazography."

Nazography, says the author of the system, permits of divining the character, habits, and inclination of people by a simple inspection of their noses.

According to this system, the nose should be as long as possible, as this is a sign of merit, power, and genius. Example: Napoleon and Cæsar, both of whom had large noses.

A straight nose denotes a just, serious, fine, judicious and energetic mind; the Roman nose, a propensity for adventure; and a wide nose with open nostrils is a mark of great sensuality. A cleft nose shows benevolence; it was the nose of St. Vincent de Paul.

The curved, fleshy nose is a mark of domination and cruelty. Catherine de Medici and Elizabeth of England had noses of this kind. The curved, thin nose, on the contrary, is a mark of a brilliant mind, but vain and disposed to be ironical. It is the nose of a dreamer, a poet, or a critic. If the line of the nose is re-entrant, that is, if the nose is turned up, it denotes that its owner has a weak mind, sometimes coarse, and generally playful, pleasant, or frolicsome.

A pale nose denotes egotism, envy, heartlessness. The quick, passionate, sanguine man has a strongly colored nose of a uniform shade. With the drinker the shade becomes more pronounced toward the tip.

Steel for Heavy Guns.

In a paper on this subject by E. B. Dorsey, C.E., before the U. S. Naval Institute, he says:

The Duke of Cambridge, Commander-in-Chief of the British Army, said in the House of Lords, on April 30, 1876: "Out of seventy heavy guns employed against the southwest of Paris (by the Germans) thirty-six were disabled during the first fortnight of the bombardment by the effect of their own fire." This is strong language from very high authority, and shows that even Krupp's guns may fail when tested by actual service. The preceding also shows the great necessity of investigation before adopting for our guns the treacherous hard steel.

All who have worked large pieces of hard steel have noticed that serious cracks and fractures originate in very slight cuts, nicks, or punctures in the metal; in fact, on this class of metal all such injuries are carefully avoided, and when they unavoidably occur are, if possible, carefully cut out. In working hard steel, in order to prevent the starting of these cracks, no holes are punched unless carefully reamed out afterward, and no edges cut or sheared unless afterward planed. Mild steel is not affected in this manner.

In battle, these large guns must receive many dents or cuts from shot from small cannons and machine guns. These injuries may not be sufficiently large to cause direct weakness of the gun, but they are ample to originate the fatal cracks so common and unaccountable in hard steel. The formation of these cracks will be accelerated by the firing of the heavy service or fighting charge of the gun. Of course, if the gun is entirely protected from the fire of small cannon or machine guns, this risk will be avoided; but, owing to the great length of modern guns, it is doubtful if its entire length can be protected from machine gun fire. Before finally adopting this class of metal for our large guns, it would be well to make experiments, to see how guns made from it would act under the same conditions as in battle. They should be subjected to a severe fire from small cannon and machine guns, and afterward fired repeatedly with the usual severe fighting charge.

Conclusions.—If it is necessary or desirable to have light guns, these can be made by using many thin hoops, or cylinders, made of mild steel, building one over the other on the barrel, instead of the thick hoop of hard steel, as called for in the ordnance specifications. The strength and reliability of the gun will increase for the same weight proportionally as the thickness of the hoops decreases to a practical limit. All that is necessary is to find out by experiment what is the proper thickness of hoops consistent with weight, strength, and cost. This thickness may be found to vary with the size and use of the gun. The gun to be used in fortifications need not be so light as that for use on shipboard. Suppose, for illustration, that instead of using thick hoops of hard steel, twelve hoops made of mild steel be used, placing one over the other. By putting the proper amount of work on these, the tensile strength can be raised very high without impairing the quality. Moreover, if by any chance one or two of these hoops should break or fail, the remaining ones will be ample to sustain the strain, as they would always be used with a large factor of safety. A gun, if properly constructed and proportioned, made in this manner, of mild steel, could not fail, even with any reasonable amount of bad treatment. This is a practical application of the old adages: "In union there is strength," and "Not to put all your eggs in one basket."

The steel that I advise to be used for making guns is the ordinary mild steel of commerce, made by a great many establishments in the United States in large quantities, and which can be had at any time in any desired quantity. It is now selling at about sixty dollars per ton.

The hard steel called for in the specifications is a special product, not used to any extent in commerce, being too unreliable and expensive for any commercial use. It must be manufactured to order, and owing to this and to the severe specifications, the cost will be great.

By the use of many and thin hoops, or cylinders, of mild steel, properly built up and proportioned, a gun can be made that will be at all times safe, reliable, and unfailing. If hard steel, or steel of high tensile strength, in thick hoops is used, the gun will be more costly, and of greater theoretical strength, but practically much weaker, and will fail when least expected, and without any apparent cause or reason. If it is necessary to have thick hoops, as called for in the ordnance specifications, make them of mild steel, giving the necessary strength by additional material. This may make a heavier gun, but it will always be safe and reliable. Hard steel should not be used until much more is definitely known of the supposed improvement of oil temper o.a large pieces or masses of metal.

Protection of the Ears under Cannon Firing.

Dr. Samuel Sexton, of this city, says: "It is the experience of many officers that the vibrations of great intensity which are given off from some field pieces and bursting shells, charged with high explosives, are more disagreeable than the heavier sounds of great guns. The metal itself vibrates under these circumstances similarly to a tuning fork.

"A very disagreeable jar is imparted to the temporo-maxillary articulation when the individual is near a great gun being fired off. This is lessened, it is believed, by standing on the toes and leaning forward. Some simple precaution, to be employed by officers and men during artillery practice, would seem very much needed, since aural shock is not only painful and distressing, but orders cannot be well heard while the confusion lasts.

"There is probably no better protection than a firm wad of cotton wool well advanced into the external auditory canal. In suggesting this protection, it is believed that harm can seldom take place from pressure of air from within, since it is known that the violent introduction of air into the tympanum from the throat, by means of Politzer's method of inflation, seldom ruptures the drum head, though, if such a volume of air were suddenly driven into the external auditory canal, the drum head would in nearly all cases be ruptured."

Hand Fire Grenades.

An analysis of the contents of one of Hayward's hand fire grenades has been communicated to the *Chemisch-Technische Zeitung* by Herr A. Gawalovski, of Brunn. He finds that it is full of a colorless liquid of sp. gr. 1·1986, neutral to test paper, and giving the following composition on analysis: Chloride of calcium 18·329, chloride of magnesium 5·700, chloride of sodium 1·316, bromide of potassium 2·170, chloride of barium 0·265, water 72·211, with traces of iron and aluminum chlorides. The flasks have a volume of about 600 c c., are filled at ordinary atmospheric pressure, and can be made at a very trifling cost. Harden's fire grenade consists of a solution of common salt and sal ammoniac, and Schonberg's of a solution containing one part soda to three parts common salt. The value of the solutions in these three grenades he estimates at about 3, 5, and 1 pfg. respectively per flask, or in English coinage at one-third, one-half, and one-tenth of a penny.

The Causes of Paper Turning Yellow.

The author contends that the yellowing of paper is due to an oxidation determined by light, and especially by the more refrangible rays. This discoloration is more striking in wood papers than in rag papers. Dry air is another important condition for the preservation of paper. The author thinks that in libraries the electric light is inferior to gas, on account of the large proportion of the more refrangible rays present in the former.—*Prof. Wiesner.*

A NEW LABORATORY TROMP.

The suction apparatus formerly used in laboratories consisted of a bottle from which water was allowed to flow, and which had the inconvenience of being cumbersome. For obtaining a vacuum, recourse was had to the air pump—a costly apparatus; and for forcing air into the blow pipe, the device used was a bellows operated by foot. All this is now replaced by the suction and force tromp, which merely requires to be connected with the faucet of a water pipe. With this remarkable apparatus, one has nothing to do now but open and regulate two cocks in order to obtain a continuous supply of air under pressure. The apparatus is shown in its entirety at T, in Fig. 1, where are also shown some of its applications. In the first place, it communicates with a safety bottle, F, which is provided above with a valve to prevent the water from entering the vacuum apparatus—an event that would occur should the pressure of the water happen to diminish suddenly in the pipes. R is a board, to which are affixed two glass cocks, forming a double T. This arrangement permits of obtaining a vacuum in two different directions. M is a pressure gauge that shows the degree of the vacuum produced in the various apparatus. M' is a pressure gauge that can be moved from place to place. These two instruments are so constructed that they can be easily filled and cleaned, and their scales are detachable. C is a bell glass with polished edges, and which is provided at the top with a polished glass cock. It rests upon a base which has been polished with emery, and which is cemented to a metallic frame supported by four legs. This bell glass covers a stand upon which capsules or vessels containing extracts may be placed. Under the lower shelf of this stand is placed a vessel containing sulphuric acid. The degree of vacuum is ascertained through a small manometer.

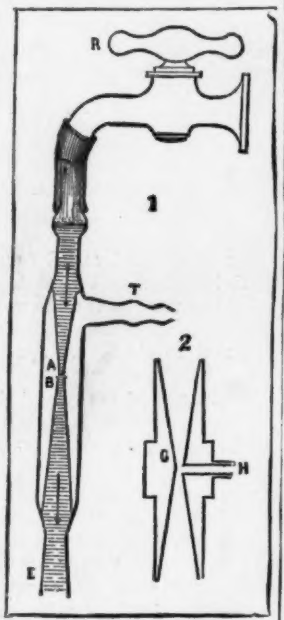


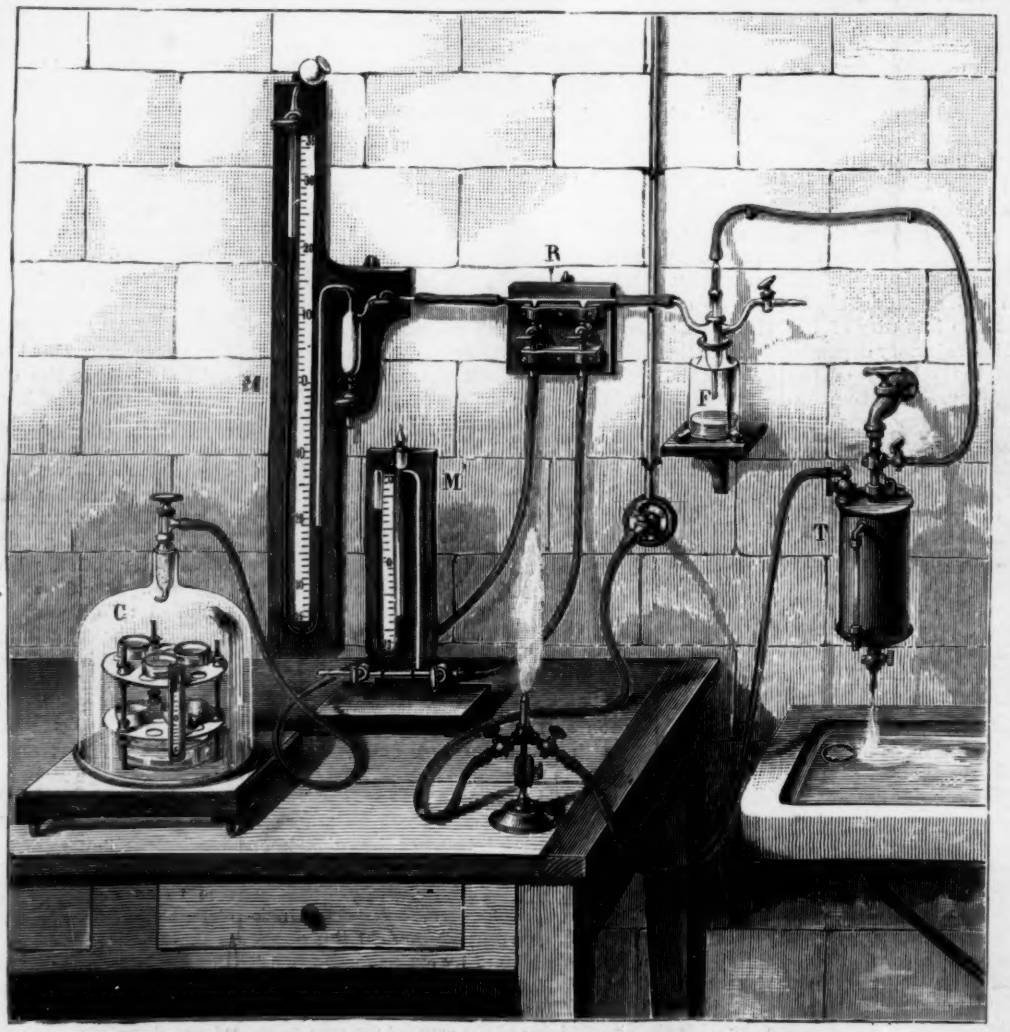
Fig. 2.—PRINCIPLE OF THE TROMP.

In the foreground may be seen the gas burner that the tromp converts into a blow pipe when air is forced into it. It only remains now to explain the mode of operation of the apparatus. The tromp is based upon the principle of the Giffard injector, and was devised in 1872 by Mr. Lane, a pupil of Deville's. Shortly after that period, the brothers Alvergniat put the first models of the apparatus into the market, and the use of them has now become general in laboratories.

The tromp, which is made of glass, consists of two conical nozzles, A and B, arranged as shown in the diagram in Fig. 2. The water enters through the faucet, R, passes from cone A into cone B, as in the injector, and, on making its exit, carries along with it the air that it has sucked in at T. The water that flows out at E is thus mixed with air. The suction of the tube, T, is very strong, and, upon putting the tube in communication with a bell glass, it is possible to obtain a maximum vacuum, which varies in winter and summer according to the tension of the aqueous vapor.

The apparatus may be made of metal. Mr. Alvergniat, in his new apparatus, has connected the two cones at G (2, Fig. 2), and left but one aperture, H, or two apertures, as shown in Fig. 3, which represents one of the metallic tromps at *t t'*. The tube through which the water flows is prolonged in a metallic cylinder, G. If the lower cock, D', be nearly closed, a certain quantity of water will accumulate in the cylinder and compress the air therein, and the latter will escape under pressure, through the cock at the top. It is possible to obtain a pressure of 0·10 m. of mercury. The discharge of compressed air is regulated through the cock, D'.

This exceedingly practical apparatus is destined to render valuable services to physiologists, botanists, and all laboratories of science.—*La Nature.*



LABORATORY TROMP AND OTHER APPARATUS.

Capitalists and Inventors.

Inventors often complain of the difficulty experienced in inducing capitalists to join them in their enterprises. No doubt there is often good ground for such complaint. Not infrequently, however, we think the blame rests as much with the inventor as with the man of money. It must be remembered that usually the inventor studies the field more closely than the capitalist, because he has more time, and his attention is more closely directed to the investigation. It can hardly be expected that the man who devotes one hour to a superficial investigation of the subject can explore it so deeply and satisfactorily as the one who has given to it months and perhaps years. The capitalist is often blamed for not seeing into the advantages of an enterprise, when the fact is it has never been presented to him in the right light. Some one makes an important discovery, which, if utilized, will seemingly yield large results. Capital is invoked, but no systematic method is employed to demonstrate that the returns for an investment in working this new field of discovery will yield profitable results. Inventors too often think that capitalists should take their simple assertion that the invention will yield large returns. This would be very well if inventors as a class were not over-sanguine, and their predictions in a business way did not so frequently prove futile.

Every investor has a right to have some reasonable assurance that his money will be spent in a profitable direction. Money is the great lever that moves the world. If judiciously employed, it is a source of great gain; if wrongly employed, it too often becomes powerless for good. Every man, therefore, who would seek the aid of capital in furthering his plans for introducing an invention should first be prepared to show the whole state of the art covered by such invention, and wherein the improvement exists. Second, he should, if possible, show what particular market needs to be supplied with such improvement, and something approximating to the returns which reasonably may be expected. Third, he should have some well settled plan of introducing the new product or furthering the new scheme. Fourth, it should be supported by well considered arguments tending to the convincing of the men whose money will be embarked in the enterprise. Because, however sanguine the inventor may be, the man who is called upon to risk his money should be shown a reasonable hope for obtaining fair returns, and, further, that investment is measurably safe.

The general denouncement of capitalists for their proverbial slowness in coming to the rescue of inventors is too often ill timed. There are millions of dollars to-day invested in experimental plants and in promoting new discoveries. We are glad to say that in the majority of cases these investments have proved very lucrative. Probably no field of enterprise offers more allurement than this, and if capital is not always secured, it does not follow that the man with the money is to blame. Inventors must employ business methods when approaching business men. If they are not capable of doing this, let them employ a third party, who, in many cases, furnishes the missing link between the patent and the bank account.

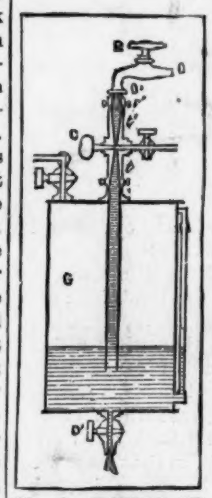


Fig. 3.—SECTION OF THE APPARATUS.

There are without doubt thousands of patents which have never been introduced to the public, which would yield very large fortunes to any one who would take them up and work them properly. Whose fault is it? Probably not the capitalists', for they are, generally speaking, only too glad to find a good way to invest their funds. The blame, if any, rests upon the inventor, who, in many instances, places so high a value on his invention that capitalists cannot afford to assume the risk of introducing the new thing, or because the inventor has not taken the right method or adopted the proper plan of bringing his matters to the attention of the men whose aid he invokes.

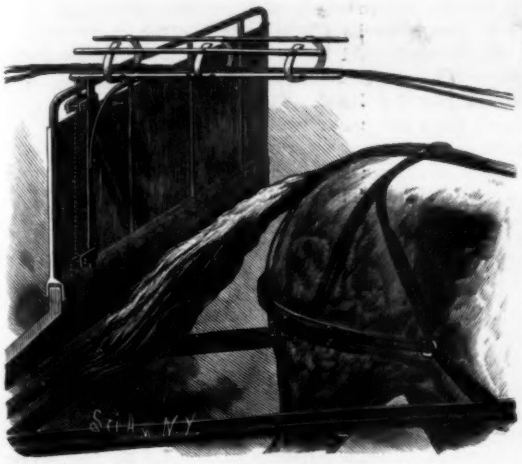
Inventors, often, get too easily discouraged. They bring their invention before three or four capitalists, none of whom feels disposed to introduce it, and they immediately give up, blaming the stupidity of capital, and bemoaning their own sad lack of funds. Now, the commercial traveler does not thus easily lie down under difficulties. He moves on from town to town. Each negative answer he gets only urges him forward to the man who he is sure sooner or later will be found to say yes. If the inventor had more of the commercial instinct, more of the commercial man's persistency and push, more of his indomitable will and pluck, he would succeed. There is far less trouble with capitalists than with inventors themselves. It really seems as though in most cases a "go-between" were absolutely necessary. When the inventor himself fails of eliciting help, the best thing he can do is to obtain the services of some keen, shrewd, far-seeing business man to help him out of his difficulty. If his invention is worth pushing, nine cases out of ten there will be little trouble in procuring financial help if the proper methods be employed.—*The Industrial World.*

Nickel Bromide.

Nickel bromide has been employed medicinally as a hypnotic and a sedative. According to Mr. A. Drew (*Amer. Jour. Pharm.*), it may be prepared conveniently by treating granulated nickel with bromine under water, and carefully evaporating the dark green solution, when the salt is obtained in deep green deliquescent crystals, freely soluble in water, but much less soluble in alcohol. The salt is conveniently administered in the form of a sirup, which may be prepared by placing 377 grains of bromine and 137 grains of nickel in a flask containing 12 ounces of water, digesting at a gentle heat until the reaction has ceased, filtering, and then adding 24 ounces of sugar and sufficient water to make 32 fluid ounces. The sirup, which is of a beautiful green color, contains in each fluid drachm 5 grains of crystallized nickel bromide, which is an average dose.

REIN PROTECTOR.

This device is attached to the dashboard of the vehicle, and is intended to inclose the reins, so as to prevent the horse from getting them under its tail. To the bottom bar of the skeleton frame are secured elliptical rings, the upper sides of which are split and separated a sufficient distance to admit of readily placing the reins within and removing them from the rings. To the tops of the rings, on opposite sides of the slits, are secured bars. Secured at right angles to one end of the lower bar are two rods, placed a suitable distance apart to receive the dashboard between them. These bars are held to the dashboard by U-shaped



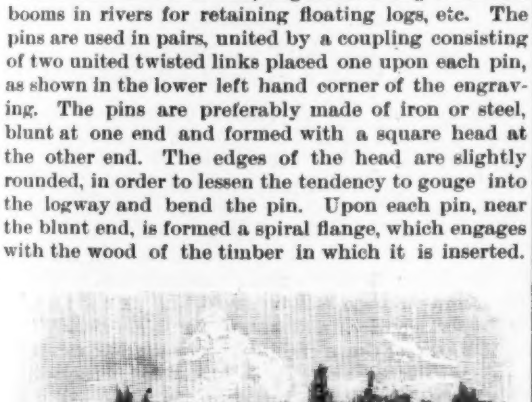
LEITH'S REIN PROTECTOR.

clips, as shown in the engraving. The horizontal part of the protector—that stretching in front toward the horse—has a maximum length of fifteen inches, and is raised sufficiently to have the reins at least six inches above their ordinary height. The protector may be applied to either side of the vehicle, and it is evident that when the reins are placed in the rings they will be protected against interference of the horse's tail.

This invention has been patented by the Rev. David Leith, of Trenton, Tenn.

RAFTING BOOM PIN.

This boom pin is designed to be used in connection with a link or other coupling for forming rafts and booms in rivers for retaining floating logs, etc. The pins are used in pairs, united by a coupling consisting of two united twisted links placed one upon each pin, as shown in the lower left hand corner of the engraving. The pins are preferably made of iron or steel, blunt at one end and formed with a square head at the other end. The edges of the head are slightly rounded, in order to lessen the tendency to gouge into the logway and bend the pin. Upon each pin, near the blunt end, is formed a spiral flange, which engages with the wood of the timber in which it is inserted.



BUISSON'S RAFTING BOOM PIN.

The spiral is of very steep pitch, in order to leave a portion of the body of the pin between the coils, and its lower end is beveled to a point and terminates flush with the surface of the pin just above the end. In applying these pins a hole is bored in the two sticks of timber to be united, the holes being slightly longer than the body of the pin. The pins are then screwed down by a key or wrench applied to the heads. The spirals enter the wood, and securely hold the pins to the timber.

This invention has been patented by Mr. Cyprian Buisson, of Wabasha, Minn.

On the Absorption and Elimination of Mercury in the Human Organism.

Dr. Welander has made a series of experiments to determine how mercury is absorbed by and eliminated from the body. To the urine is added liquor sodæ and a little honey, and the mixture boiled for a quarter of an hour in a retort. Then the liquid is poured out into a glass, where it is left until complete precipitation has taken place. Next, the fluid is poured off, and the precipitate is placed in a glass retort. A little hydrochloric acid is added, and a piece of copper wire, three centimeters long and half a millimeter thick, which has just been heated to a red glowing heat, is placed in the retort. The fluid is now heated to the boiling point, and the opening of the retort closed with a cork, after which the retort is placed in an oven at a temperature between 95° and 149° F., and left there for thirty-six or forty-eight hours. At the end of that time the wire is taken out, dried, and placed in a thin glass tube, the opening of which is closed by melting. That part of the tube which contains the wire is heated over a very weak flame of an alcohol lamp. In consequence of this procedure, the mercury is sublimated, and deposited as small metallic globlues in the upper part of the tube.

The presence of iodine salts prevents the precipitation, and they must, therefore, be removed from the urine if it contains any. The best way of doing this is to collect the precipitate formed after the first boiling on a filter, and pour a little water on it once or twice. We must not take too much water, because the mercury is soluble in water.

The test described is so fine that mercury has been found in a solution of corrosive sublimate of 1 in 10,000,000.

The experimenter must make sure that his reagents do not contain any mercury, which is often the case with hydrochloric acid.

Sometimes the globules of mercury are visible to the naked eye, but the safest way of examining them is by means of the microscope.

When mercury is given by the mouth, it appears, as a rule, in the urine one or two days later. Administered through the anus, it was already found the following day. When applied through the skin, it appeared likewise, as a rule, on the following day in the urine.

Mercury is rapidly absorbed by wounds and ulcers.

Injected under the skin, mercury is very rapidly absorbed, and appears often in the urine as early as one or two hours after the injection.

Mercury is constantly eliminated with the urine; a very great part, and perhaps the greater part, of what has been introduced into the body leaves it in that way.

The salivary glands play quite a secondary role in this respect.

The fæces, on the other hand, contain constantly mercury, and often in considerable quantity.

Mercury is likewise eliminated with the milk, and was found in the urine of the nursling.

The elimination takes place in proportion to the amount introduced.

Welander discredits the statement of Paschkis and Vajda that mercury may remain for twelve or thirteen years in the body. He has, as a rule, found it four or six months after the end of the treatment; frequently it is found from six to twelve months, and sometimes even more than a year, after the treatment has been discontinued.

Welander thinks mercury circulates in a soluble form with the blood. He found it in abundance in this fluid in every case examined. He found it likewise in pus taken from patients treated with mercury, and in ascitic fluid.

The conclusion to be drawn for practice from these experiments is that when a rapid and powerful effect is aimed at, the administration of mercury by hypodermic injections is preferable, while for the intermittent treatment of Fournier the mercurial pills will do as well.—*Dr. Edward Welander, Abst. fr. Nordiskt Medicinískt Arkiv, xviii., No.* 2, 1886.

Defense of New York within Thirty Days.

Captain Ericsson, of Monitor fame, writes as follows to the New York *Herald:*

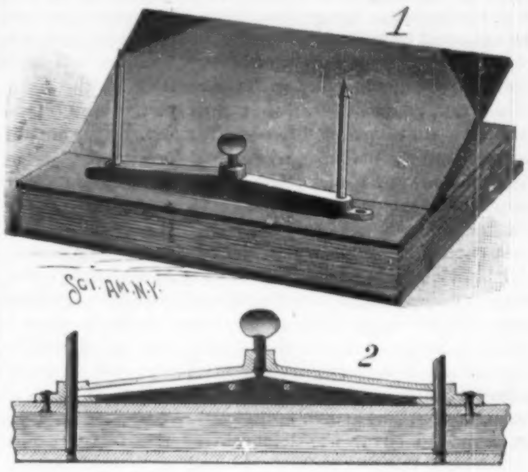
I have read with much attention the editorial paragraphs published in several journals relating to the Destroyer and its submarine gun, and beg to state for the information of all concerned that the Destroyer system so completely solves the problem of applying submarine artillery for defending harbors that I have had no occasion to waste time on the consideration of any other method. Moreover, the extraordinary caliber of the submarine gun employed in the Destroyer, viz., 16 inches, has presented no practical difficulties, and has not failed in a single instance during a long series of trials to expel the submarine projectile with a velocity exceeding 300 feet in three seconds.

It should be mentioned that this projectile is 25 feet long and carries 300 pounds of guncotton, a charge sufficient to shatter the hull of ironclad ships of all classes so completely that the boasted "water-tight compartments" will prove of no avail in preventing destruction and sinking. JOHN ERICSSON.

BINDING FILE.

The accompanying engraving represents an improved binding file, which is the invention of Mr. James W. Dickieson, of 17 and 19 Rose Street, New York city. Near one end of the bottom cover are two upright rods, pointed on their upper ends. To the upper surface of the top cover is fastened a guide frame formed with apertures fitting over similar ones in the cover. In a recess in the guide frame are placed two bars, held at one end by a bearing in the frame, the other end being supported by a pin. Through the middle of the guide frame passes a screw, which is pointed at its lower end. The sectional view, Fig. 2, clearly shows the arrangement of these parts.

In order to place additional documents on the file, or



DICKIESONS' BINDING FILE.

to remove those already on, it is necessary to remove the top cover. The documents are placed over the pointed uprights and pressed downward in the usual way, when the top cover is placed on the rods and moved down until it rests on the papers. The thumbscrew is then screwed down so that its pointed end forces the bars outward until they press against the uprights, and thereby lock the top cover in place. When the thumbscrew is turned in the opposite direction, the bars are released from the uprights. The cover and any of the documents can then be removed, the thumbscrew serving as a handle.

CHILD'S TRAY.

In this tray provision is made for holding a plate in a protected position, and also for receiving a drinking vessel, while any liquid spilled upon the tray will find its way to an under or subsidiary tray. In the bottom of the main tray is a large circular opening, the edge of which is struck up to form a convex or embossed surface. The purpose of this opening is to expose the receiving surface of a plate placed upon the under tray and held firmly by the inwardly curved edge of the opening which bears upon it, as shown in the lower sectional view. The convexed surface accommodates the flaring sides of the plate, and serves as an additional stay therefor. Toward the upper right hand corner of the tray is an opening to receive a glass, and

COUSINS CHILD'S TRAY.

at intervals in the bottom are cut drain apertures, through which any spilled liquid will flow to the subsidiary tray, which is of the usual construction, and in which the main tray rests. In such a tray the child has easy access to the contents of the plate, but cannot remove the plate itself, and the glass is so held that it is not liable to be overturned.

This invention has been patented by Mr. Thomas Cousins, of Norwalk, Conn.

Left-Handedness.

Dr. Daniel Wilson, president of the Royal Society of Canada, has lately contributed a paper to the *Proceedings* of that society on the subject of left-handedness, to which he has managed to give an unexpected and very practical interest, affecting all who have children or who are concerned in their education. The author had written previously on this subject, but not with such full and effective treatment. He reviews the various causes to which the general preference of the right hand has been ascribed, and also those to which the occasional cases of left-handedness are attributed, and finds them mostly unsatisfactory. He shows clearly that the preferential use of the right hand is not to be ascribed entirely to early training. On the contrary, in many instances where parents have tied up the left hand of a child to overcome the persistent preference for its use, the attempt has proved futile. He concludes that the general practice is probably due to the superior development of the left lobe of the brain, which, as is well known, is connected with the right side of the body. This view, as he shows, was originally suggested by the eminent anatomist, Professor Gratiolet. The author adopts and maintains it with much force, and adds the correlative view that "left-handedness is due to an exceptional development of the right hemisphere of the brain."

A careful review of the evidence gives strong reason for believing that what is now the cause of the preference for the right hand was originally an effect. Neither the apes nor any others of the lower animals show a similar inclination for the special use of the right limbs. It is a purely human attribute, and probably arose gradually from the use, by the earliest races of men, of the right arm in fighting, while the left arm was reserved to cover the left side of the body, where wounds, as their experience showed, were most dangerous. Those who neglected this precaution would be mostly likely to be killed; and hence, in the lapse of time, the natural survival would make the human race, in general, "right-handed," with occasional reversions, of course, by "atavism," to the left-handed or, more properly, the ambidexterous condition. The more frequent and energetic use of the right limbs would, of course, react upon the brain, and bring about the excessive development of the left lobe, such as now generally obtains.

The conclusions from this course of reasoning are very important. Through the effect of the irregular and abnormal development which has descended to us from our bellicose ancestors, one lobe of our brains and one side of our bodies are left in a neglected and weakened condition. The evidence which Dr. Wilson produces of the injury resulting from this cause is very striking. In the majority of cases the defect, though it cannot be wholly overcome, may be in great part cured by early training, which will strengthen at once both the body and the mind. "Whenever," he writes, "the early and persistent cultivation of the full use of both hands has been accomplished, the result is greater efficiency, without any corresponding awkwardness or defect. In certain arts and professions, both hands are necessarily called into play. The skillful surgeon finds an enormous advantage in being able to transfer his instrument from one hand to the other. The dentist has to multiply instruments to make up for the lack of such acquired power. The fencer who can transfer his weapon to the left hand places his adversary at a disadvantage. The lumberer finds it indispensable, in the operations of his woodcraft, to learn to chop timber right and left handed; and the carpenter may be frequently seen using the saw and hammer in either hand, and thereby not only resting his arm, but greatly facilitating his work. In all the fine arts the mastery of both hands is advantageous. The sculptor, the carver, the draughtsman, the engraver, and cameo cutter each has recourse at times to the left hand for special manipulative dexterity; the pianist depends little less on the left hand than on the right; and as for the organist, with the numerous pedals and stops of the modern grand organ, a quadrumanous musician would still find reason to envy the ampler scope which a Briareus could command."

That all this is true is abundantly shown by the numerous examples cited by the author, from the greatest of artists, the left-handed Lionardo da Vinci, to the distinguished ex-president of the American scientific association, Prof. Edward F. Morse, and (we may add) to Dr. Wilson himself, both of whom are known to be accomplished draughtsmen with this too-neglected hand. In view of these facts, it is evident that few more important subjects can be offered for the consideration of educators than that which is presented in this impressive essay.—*Science*.

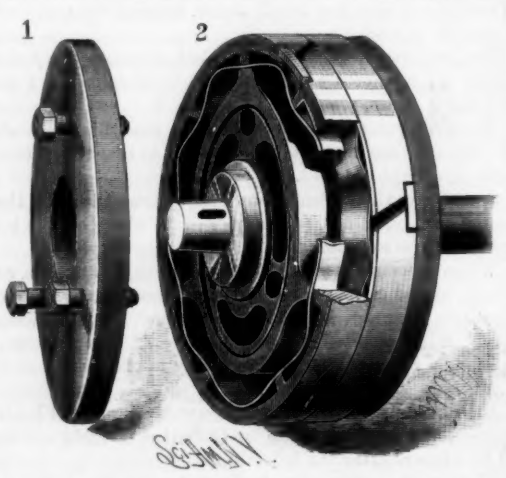
Thirty-three Years Ago.

Mr. James P. Slater, of Baxley, Ga., in a letter referring to some patent business recently transacted for him through this office, adds as follows:

"Accept my thanks for the prompt manner you have done my business. You are the same old Munn & Co. you were in 1854, when you obtained a patent for me on circular saws."

PISTON HEAD FOR STEAM ENGINES.

Two split metal packing rings are placed upon the body of the piston, which has a flange at one side of less diameter than the cylinder. Upon the other side of the piston an annular disk, Fig. 1, is held by bolts. The disk is of the same diameter as the flange, and the adjacent faces of both are faced off to form flat and true seats for the outer edges of the two packing rings. The body of the piston, between the screw-threaded openings, is recessed to reduce its weight, and opposite each opening a projection or lug is formed to strengthen the body at the points where the bolts enter it, while between these lugs the metal is removed to still further lessen the weight. The packing rings are duplicates of each other, each being split diagonally, and are constructed to form a recess in their outer edges, opposite the openings, to receive small blocks, shown in the perspective view, Fig. 2, which serve as steam checks, to prevent steam from entering the piston head at the openings. Each steam check is held in place by a small lip, which enters a corresponding depression formed in the side recess of each ring. Upon the inner surfaces of the rings are formed lugs, and a circular spring, fitted within each ring, acts to expand it. The springs are endless, and are corrugated in such a way as to bear upon both the lugs and inner surface of the rings between the lugs, so that they may be readily introduced, and so that their outward pressure will be equal at all parts of the rings. Between the two rings is placed a



McCART'S PISTON HEAD FOR STEAM ENGINES.

corrugated spring, the waves of which form opposite small curved springs, which are compressed when the bolts of the disk are screwed down, so that they act constantly to spread the rings apart, and thus force their outer flat surfaces against the flat seats of the flange and disk to form steam-tight joints that prevent the steam from entering the piston head between the rings and their confining surfaces. The adjacent surfaces of the rings are slightly cut away, to form a space for the interposed spring, and to form outer surrounding lips to confine the spring.

This invention has been patented by Mr. John McCart, of 204 East 21st Street, New York city.

An Improved System of Gas Lighting.

There was recently shown at the Marlborough Picture Gallery, Pall Mall, London, an interesting system of gas lighting, the invention of Dr. Carl Auer von Welsbach, of Vienna. This system produces a pure, steady, and brilliant light, which is perfectly smokeless, and has comparatively little heating effect on the atmosphere. The system might be described, in fact, as partaking of the character of a new form of gas burner, called the Welsbach lamp, which can be screwed on to all ordinary gas fittings. There is placed within the gas flame—of special form of atmospheric or Bunsen burner—a mantle or hood of cotton net or webbing that has been previously steeped in a solution containing oxides of the elements zirconium, lanthanum, and some other bodies. The moment that a prepared mantle is ignited it burns away with the smoky flame characteristic of burning cotton, but it leaves behind it a residual skeleton composed of the incombustible oxides contained in the impregnating solution; and this skeleton, while preserving its woven or reticulated character, becomes, under the influence of the Bunsen flame, powerfully incandescent, emitting a white and brilliant light, resembling somewhat that of an incandescent electric lamp.

It is stated that the mantles so employed last from 800 to 2,000 hours, and they, of course, can be renewed. Further, it is claimed on behalf of this system that it effects a saving in the gas consumed. It is represented that while a standard Argand gas burner, consuming five feet of gas an hour, gives an illumination equal to 16 standard candles, or 3·2 candles per cubic foot of gas an hour, the Welsbach burner produces a purer light of 20 candles with 2¼ feet of gas per hour, showing an efficiency of 8 candles for each cubic foot of gas consumed. As the gas consumed is employed solely to heat the light-giving mantle, it need possess no illuminating property in itself, and therefore gas of poor illuminating quality may be employed under the Welsbach system, with a corresponding saving of cost. The Marlborough Picture Gallery was lighted by 56 Welsbach lamps attached to brackets arranged along a central pipe running from end to end of the gallery.

Hints on Building.

Put up the frame and get a roof over it as soon as may be, say in May or earlier. Then let it stand until the first of September to season. This is the old fashioned way, and it has advantages which those who have had experience with shrinking timber will not be slow to appreciate. In this part of the country the timber for a frame is always green when it is put up. Indeed, hemlock could not be worked very well dry. It is much better to have the shrinkage done before the inside finish is on than after.

All floors should be double. A layer of sheathing paper between them would not be a bad idea, and would pay for itself. The upper floor ought to go down after the mason work is done. A smooth, nice floor is a great preserver of carpets.

Back of the wash boards the space should be filled in with bricks. The ends of the floor timbers ought to be filled in such a way as to prevent rats and mice from having a free passage. Such a filling greatly diminishes the danger from fire.

Do not let the tinman or the contractor persuade you that the gutters should be left until red with rust before they are painted. It is a plan which is designed to benefit them exclusively. The paint goes on more easily after the red rust begins. The tin, however, has begun its own destruction, and will go on rusting under the paint just as steadily as though it had no protection, though perhaps not quite so fast. Tin roofs should not be allowed to get red. They can be cleaned and painted on one side in the shop. The objection to this is that the resin or acid (none of the latter should be used) needs to be cleaned off by the rains, so that the paint will stick. The best plan is to have the cleaning done at once, without waiting for the rain.

All piping should be put into the house while it is in the frame. This saves expense and much cutting of woodwork. Alongside each chimney it is a good plan to have a space extending from floor to floor in which pipes can be run if desired. The chimney breasts and the spaces which they cover ought to be plastered on wire lath, for safety, and thus avoid shrinkage.

Have a spare flue in each chimney, to be used for ventilation. The open fireplace, as a ventilator, however, is a delusion. Make openings into the flue at the base board, and by proper management of doors and windows, perfectly pure air can be secured in every room.

Heat by a big hot air furnace several sizes larger than the furnace makers recommend. This furnishes the means for perfect ventilation, by providing an ample supply of warm, pure air. Keep the pipes and registers perfectly clean, or the smell of cooked dust will be mistaken for that bugaboo "burnt air."

In plastering do not use a "brown coat" of mortar. Put the finish directly on the "scratch coat." Time, labor, and patience will be saved, and the work will be better, harder, and more durable. Build the foundations for the piers, in the cellar, with as much care and deeper than those of the external walls. These piers support the center of the house, and they are frequently neglected. The result is a great crop of cracks in the plaster.

Have the walls of the upper floor 9 feet high in the clear, even if you have to cut off six inches from the floor below. This is of course for a moderate size of house. High ceilings for sleeping rooms tend toward giving the sleepers purer air by furnishing greater space. When one is drawing plans, it is best to consult with a carpenter and see whether the framing will come out even multiples of commercial lengths. It is sometimes cheaper to use the full lengths of the timber than to cut off six inches from the ends. Increasing the size of a house six or eight inches may frequently be done without any appreciable addition to the cost.

In designing, get the inside arrangement right. Have places for every piece of furniture. Arrange the bedrooms so that they will contain beds without putting them against doors or windows. Put them against inside walls if possible. Have some connecting rooms and some which do not. After all this is done, put the outside on. Let doors and windows come where they will, and do not spoil your own comfort for the sake of an external appearance which is for the benefit of your neighbors.

Lastly, have a garret by building a sharp roof. Cover the roof with dark colored slate from Maine or Vermont. Lay it in cement, and be happy.

Moral: Alterations on paper cost much less than those in wood and stone. Therefore it is better to spend a long time over the plans than to make changes on which the builder charges his own price.—*The Mechanical News.*

Correspondence.

Chemical Fire Extinguishers for Car Stoves.

To the Editor of the Scientific American:

If the hand grenade fire extinguishers possess the real value and merits claimed for them, it seems to me that a number of these grenades, so arranged in proximity to each stove that in case of an accident they would break by the shock, would at once prevent or extinguish any possible fire. Nearly all steamboats are provided with such hand fire grenades, you find them in nearly all public and in a great many private buildings, but I do not remember ever having seen any of them carried as part of the equipment of a railroad car.

Possibly some different or better form than that of the hand grenade might have to be devised for a reservoir to contain the chemical liquids, and of such construction as would be specially adapted to the wants of the case in a railroad car.

G. E. MEISSNER.

Bushberg, Mo., February 7, 1887.

Black Heterodon, or Hog-nose Snake.

To the Editor of the Scientific American:

In your issue of February 5, 1887, E. R. of Williamsport, Pa., describes a serpent which he considers "another poisonous snake of Pennsylvania." His description, however, proves beyond a doubt that it is neither new to science nor in the least degree venomous. He describes plainly the black *Heterodon*, or hog-nose snake. In 1743, Mark Catesby gave it the name of *Vipera nigra* (black viper). He represents it in plate 44, armed with fangs, and says it is venomous (because he was so informed). Dr. Harlan of Philadelphia found it in eastern Pennsylvania previous to the year 1835. He considered it a new species, and gave it the name *Coluber thraso* (braggart snake), and classed it with the harmless serpents. Prof. Baird found it near Carlisle, Pa., many years ago, and describes it under the name of *Heterodon niger*, black viper; spreading adder; non-venomous.

The posterior maxillary teeth of these snakes (*Heterodon*) are larger than the anterior, fang-like, and separated from the others by an interspace. There are *no poison glands* attached to these teeth, as in the rattlesnake and copperhead, consequently they are harmless. "The horn attached to the nose," as described by E. R., is simply a prominent, broad, and turned up rostral plate.

There is no snake found here "with a head like an eel's." The head of an eel is covered with an apparently smooth skin, not with regular plates as in all true serpents.

C. FEW SEISS.

The Chicago Fire Boat Geyser.

To the Editor of the Scientific American:

The fire steamer Geyser, which is owned by the City Fire Department of Chicago, was built at Chicago in 1886. The vessel is constructed of wood, having a length over all of 105 feet, a breadth of beam of 24 feet and 6 inches, and is of 71·60 tons burden.

To an admirer of fine lines, the portion of the body above the water line might seem to be deficient in gracefulness; but on close inspection of all the deck appointments one cannot help realizing that it is perfectly adapted to the purpose for which it was designed, and hence must be admired. The lines under the water, however, are very fine and carry the vessel with perfect ease and grace, the boat recently running to a fire through twelve inches of solid ice without once stopping.

The deck house is separated by partitions into four principal divisions, as follows: First, the wheel house and pilot's cabin, which are finely fitted up, and contain, besides the steering apparatus, two bed lounges and other furniture for the comfort of its occupants. The heating apparatus for this cabin is a novel and efficient one to the last degree, being simply a boxed register set into the forward end of the boiler jacket, this being made possible by the proximity of the boiler room, which adjoins the cabin.

The engine room forms the third division, and immediately in the rear of this lies the officers' cabin, which is heated by steam and compares favorably with the cabins of many of the finest private yachts. To an engineer, however, the real beauty of the vessel is concentrated in the engine room. Here indeed we find the perfection of engineering skill. The two high pressure engines have a piston stroke of 20 inches, the diameter of the cylinders being 18 inches, with 446 indicated horse power. These engines, which were designed and built by Chas. F. Elmer, are models of perfection in every respect, being supplied with steam reversing gear of most perfect action, which allows a cut-off at any point, and is instantaneous and sure in response to the simple reversing lever. The faultless working of the engines is shown by the fact that the boat when running at a rate of twelve miles an hour can be reversed and started back within a space of twenty feet, or less than one-fifth of the length of the vessel. The engines are coupled directly to a four bucket sectional wheel, eight feet in diameter.

Water for fire purposes is supplied by two double steam pumps, built by Clapp & Son. The steam cylinders of these pumps have a 17 inch bore and 10 inch stroke; the water cylinders having a bore of 9 inches with a 10 inch stroke, the pumps being vertical. The water is received through two 12 inch seacocks, one on each side of the boat, the cocks being so arranged that either or both may be used to supply either set of pumps. There are fourteen 3½ inch discharge gates. The pumps are capable of throwing eight two-inch streams 249 feet; but the greatest effect is produced from a stand pipe from which a four-inch stream is thrown 425 feet with sufficient force to splinter boards and even large timbers as though they were eggshells. Both engines and pumps are as near perfection in every respect as it was possible to make them, even being fed with oil by automatic oil pumps, thus dispensing with oil cans and their attendant bother and dirt. Steam is supplied by a single steel boiler 16 feet in length, 11 feet and 4 inches in diameter, with 4 flues 3 feet in diameter and three-eighths inch in thickness, built by John Mohr & Son, and is allowed to carry a pressure of 100 pounds per square inch.

The boiler plate is 0·62 inch in thickness, tensile strength 55,000 pounds, ductility 54·67. The grate surface is 84 square feet, and the heating surface is 2,780 square feet. The boiler is fed by both inspirator and pony pumps. In the forward part of the boat is a water tank holding 587 gallons, for use when clean water cannot be obtained through the sea-cocks, and is supplied with water from the city hydrants. On deck at the stern of the vessel are two hose carts, carrying 1,000 feet of hose three inches and a half in diameter, which can be run to any part of the deck.

With a steam pressure of 95 pounds, the engines make 150 revolutions and give a speed of between 17 and 18 miles an hour. The boat is supplied with both chime and modoc whistles, the latter being used as a fire whistle. There are sleeping accommodations on board for four officers and eight men, who comprise the crew and fire company. The Geyser is commanded by Capt. Wm. A. Cowan, a man of acknowledged ability, and is certainly a great credit to the Chicago Fire Department, and will undoubtedly render efficient service.

A. T. FAY.

Chicago, January 27, 1887.

India Paper.

The tenuity, softness, and strength of the paper manufactured in China have sometimes given it the name of silk paper. Many persons, deceived by the appearance or the name, really think the paper is made of silk; but a careful examination shows that it is of vegetable origin.

It was toward the end of the first century of our era that a mandarin of the palace—a distinguished physicist—discovered the secret of reducing the bark of a few trees, as well as old fabrics, into a very fine pulp, by boiling them in water. Out of this pulp he made various kinds of paper.

At present, *chi*, which is the Chinese name for paper, is made of various materials. It is made of hemp, of the bark of the mulberry and several other plants, especially the bamboo, of the bark of the cotton plant, of rice and wheat straw, and of the membrane found in the cocoons of silkworms.

Sometimes the substance is wholly bamboo. In this case it is taken from the largest canes, the shoots of the preceding year. After taking off the green epidermis of these, they are split into straight pieces six or seven feet long, which are allowed to set for a fortnight in a muddy pond. They are afterward washed in clean water and spread out in a dry ditch. Then they are reduced to a harl, which, after being bleached and dried in the sun, is thrown into large boilers, and after being boiled therein is pounded in mortars until it is reduced to a fluid pulp. To this pulp is added a definite proportion of a gum that the Chinese extract, through maceration, from a plant that produces long and little shoots, and the epidermis of which is smooth and is known in China under the name of *hotong*.

The mixing is done in reservoirs three or four feet in depth, from which the workmen dip up the pulp with their forms. These latter are made of bamboo threads drawn as fine as brass wire, by means of a steel draw plate, and then boiled in oil until they are well impregnated with it, in order that they may not be affected by humidity.

It is said that the Chinese make paper that is sometimes sixty feet in length. It is probable that they form this of many pieces, which they skillfully unite at the moment of depositing the sheets. On coming from the form, the sheet of paper is spread upon a wall covered with a very smooth cement, and which is hollow, and heated through a furnace. The paper is applied to the wall by means of a brush in the shape of a feather. This explains the striæ that we observe on the back of the paper, while the side that has been in contact with the wall is brilliant and satiny. This mode of drying may contribute to the quality that this paper possesses of receiving impressions.

India paper has a wrong and a right side. The right side is smooth and silky, and looks as if it had been calendered, while the wrong side is rough and full of little diagonal striæ, due to the friction of the brush above mentioned.

As this paper, because of its fineness, has little resistance, and has not enough body to take an impression, it is pasted upon unsized vellum paper, which serves as a mount, and which frames it, so to speak, through margins whose whiteness brings its color into relief. The pasting requires a peculiar preparation, as follows: In the first place, by means of a scraper, all foreign matters are removed, such as vegetable filaments, hairs, earthy substances, etc. Then the sheets are spread upon a large table and their wrong side is covered with a layer of thin starch or pulp paste. This pasting is done with a fine soft brush or, better yet, with a sponge. In this operation, care has to be taken to keep the paper from getting torn, and also to prevent inequalities in the paste, which would produce a disagreeable effect when met with behind the clear tones of the proofs; and special care must be taken not to let any paste get on the smooth side, since, in working off, the paper would tear or would take but a very imperfect impression.

The sheets thus pasted are spread upon cords removed as far as possible from a fire, as the latter would cause them to shrivel up. After this they may be kept for many years, either flat or in the form of rolls, but always in a dry place. When it is desired to use them, they are folded into as many divisions as the size requires, and are placed in thirties upon a sheet of glass lying upon a table. On the first sheet are traced the dimensions of the design, and finally the sheets are cut with a very sharp knife guided by an iron ruler.

At present, India paper is cut to exactly the size marked by the boundary lines of the design, while formerly a margin of about three-quarters of an inch was allowed.

Half an hour before they are to be used, these sheets are interposed between the sheets that are to serve as mounts, and that have been wet as for ordinary printing. The dampness of the paper suffices to moisten the paste and give the India paper the suppleness that it requires in order to take an impression.

When the stone is properly inked, the paper is adjusted upon the stone by means of datum marks made with a dry-point. Then the vellum paper is superposed, and through the pressure of the roller the two sheets become united in one.

Before the interposition of the India paper, it should be subjected to another inspection in order to ascertain whether it has been properly cleaned of foreign substances. Attention should be particularly directed to those parts of the paper that are to receive half-tones. Less attention may be paid to those parts that are to receive the blacks, as here the imperfections of the paper are almost always imperceptible. Even a hole in such parts would pass unnoticed, although, were there a necessity for it, this might be stopped up by interposing between the India and vellum paper a bit of India paper, not cut with the scissors, but torn irregularly, in order that the edges of the piece be not apparent on the proof.

The fineness of India paper, its color (varying from pearly to dirty gray), and the property that it possesses of taking impressions render it very valuable to lithography. This paper softens tones, blends one of them with another, harmonizes clear tones with vigorous effects and tempers their hardness, and thus gives the print an agreeable aspect.—*Bull. de l'Imprimerie et de la Librairie.*

Norwegian Wood Pulp Industry.

The wood pulp industry in Norway for the year 1886 shows a very large increase upon the figures of a few years back, albeit prices have ruled very low. The cause for this is attributed not so much to overproduction as to excessive competition among the sellers of this article; and as a great many sales for forward delivery have been booked at extremely low prices (2*l.* 15*s.* f. o. b. Hull has in many cases been taken for wood pulp with 50 per cent water), there are no immediate prospects of an improvement. The quantity exported during the year 1886 is about 120,000 tons; in the year 1885 it was 107,651 tons; 1884, 88,220 tons; 1883, 70,464 tons; 1882, 58,884 tons; 1881, 42,194 tons; 1880, 26,055 tons. Several of the old works have extended their production during the past year, and several new establishments are in the course of erection, so the production this year may probably be put at 150,000 tons wood pulp with 50 per cent water. There have been four cellulose manufactories at work during the past year. Two for the production of soda cellulose have worked with considerable success; two have produced sulphite cellulose; one of the latter has been burnt down. Nine more manufactories for sulphite cellulose are being built, with a capacity of about 10,000 tons dry cellulose. The greater part of the Norwegian wood pulp is exported to England, France, and Belgium; in Russia the increase in the duty has stopped business, and the same can almost be said of Germany. America, too, has drawn part of her supply from Norway, but this trade is not expected to continue.

THE EARTHQUAKE IN EUROPE.

Nearly six months have elapsed since the Charleston earthquake. The coast line of the vicinity of the unfortunate city experienced a seismic disturbance unprecedented in intensity as regards that locality. The wave, starting from a center near the city, extended far and wide, affecting a vast region with shocks of greater or less severity and number. As we are going to press, the cable brings the news of a similar disaster that has affected the southern part of France and northern Italy. The Riviera, the great winter resort of the Continent, comprising the banks of the Ligurian Sea and the Gulf of Genoa, has been violently shaken by an earthquake that in its destruction of life, as last reported, far surpasses the Charleston one, and which will take its place among the memorable earthquakes of the world.

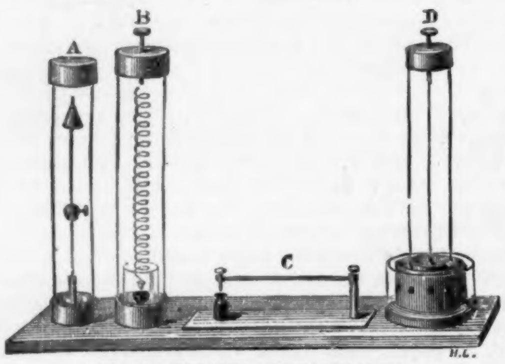


Fig. 1.—VARIOUS SEISMOGRAPHS.

On February 23, the cities of the Riviera were resting after the carnival, which had terminated the night before. At twenty minutes to six on the morning of that day, a shock was felt at Geneva; next Turin, Milan, Bologna, Leghorn, Marseilles, Toulon, and the whole Riviera felt it. It reached Cannes at 6:05, and Leghorn at 6:23. In Nice, sixty buildings were ruined and left tottering, and the tower of the church of St. Augustine was thrown down. The inhabitants left their houses, and numerous camps were established. A patrol of the military was maintained for the preservation of order. The exodus then began, six thousand people leaving the region in one day.

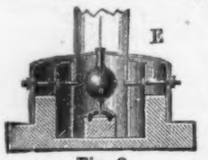


Fig. 2.
CONTACT POINT OF SEISMOGRAPH D.

The shock was felt all along the Riviera, Mentone and San Remo and the other towns being involved in the catastrophe. The Genoese region was most severely affected. Many hundred deaths are reported from the interior and coast of that district alone. In one village a loss of three hundred lives is reported. Bajardo and Diana Marino are completely destroyed. Fifteen thousand people left Nice, and twenty thousand Genoa. In Bajardo, Castellano, and Aurigo, the churches were destroyed. Shocks are reported as felt at sea at 6 A. M. and 8 A. M. off the coast. At the Vesuvius observatory no shocks were recorded. Several trains with supplies, and carrying soldiers, have been dispatched to the relief of the sufferers in the interior. The total number of deaths so far reported is between one and two thousand. The number, it is to be feared, will be rather increased than diminished by later reports.

Going inland, the shocks extended east and north as far as Parma and Turin. To the south the effects were felt on the island of Sicily, Catania, at the foot of Mount Etna, being disturbed. Damage is reported in the Basses Alpes and Department of the Var.

In Washington, D. C., which is provided with a seismoscope, set up in the physical laboratory of the United States Signal Office, a disturbance was noted at 7:33 A.M. on February 23. From this observation a calculation of the velocity of transmission of the earthquake wave will be calculated. It represents nearly 600 miles per hour.

Although the United States have felt comparatively safe from these visitations, the last year has shown that we can no longer boast of our immunity. The extinct volcanoes of the Auvergne in France, and the active volcanoes of Italy and Sicily, to a certain extent, menaced the security of the region now shaken. Yet no one anticipated such a calamity, and the future prosperity of the Riviera, so largely dependent on its winter visitors, has probably received a severe blow.

New York city has no seismograph, so no record is available for its share in the effects of the wave of transmission. This earthquake and the recent American ones will, we doubt not, lead to the establishment of one here in connection with the signal service.

To show what is done abroad in this direction, we illustrate one of the great earthquake stations of the world, and its apparatus, the Vesuvius observatory. It is erected on the side of the mountain, overlooking the beautiful Bay of Naples. The lower floor of the building contains a number of seismographs, some of the simplest construction, and others more complicated, involving registering apparatus. Several are shown in Fig. 1.

The apparatus marked A is of the simplest kind. It is a needle of steel held firmly in a vise, and its period of oscillation is adjusted by a weight that can be set at different heights. It is, though simple, extremely sensitive. B and C are intended to work electrical registering apparatus. They have contact points, that are held over mercury in cups, and kept just out of contact with it. On being vertically agitated, the points dip into the mercury, thereby closing a galvanic circuit and operating registering apparatus. B is intended for weak, and C for strong shocks. D shows an apparatus for indicating horizontal shocks. A pendulum terminating in a platinum point hangs within a glass case. The point lies within an annular trough filled with mercury, shown on a larger scale in Fig. 2 at E. The least horizontal movement causes the pendulum to swing so as to immerse the point in the mercury, closing an electric circuit and effecting the registration.

To produce the registration, an apparatus shown in Fig. 3 is used, comprising two clocks and recording mechanism. The one marked A runs continuously. The clock B is held arrested, and only starts when a current due to the movements of the vertical or horizontal movement seismograph passes through either the electro-magnet *m m* or *n n*. Such a current attracts the armature of the magnet, starts the clock into motion, and rings an alarm bell, thereby causing the recording tape to be unrolled. We may assume the magnet, *m m*, to be connected with the apparatus for registering vertical movements. Its armature carries a pencil of definite color that marks the tape as long as the disturbance continues. The other magnet, *n n*, whose armature is provided with a pencil of different color, acts in the same way for horizontal shocks.

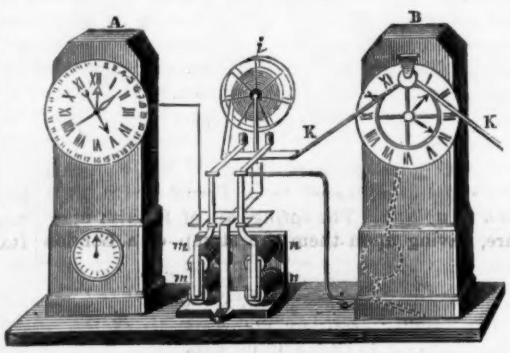


Fig. 3.—REGISTERING APPARATUS.

For undulatory movements, the apparatus illustrated in the next cut, Fig. 4, is used. A series of U tubes, one of which is shown on a larger scale in Fig. 5, containing mercury are held in a frame, some lying in the meridian and others across it. By contact points the least disturbance causes a current to flow to the registering apparatus. Each tube is provided with a float from which a cocoon fiber runs up and over a pulley, and carries a weight at its end. This moves an index attached to the axis of the pulley, and thus shows the extent of the wave movement.

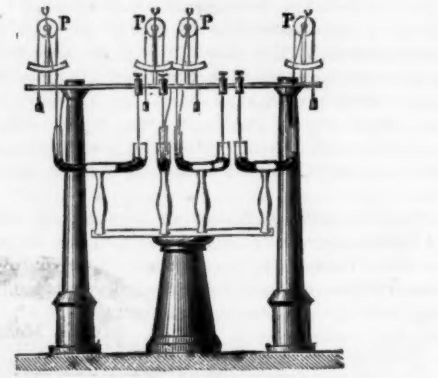


Fig. 4.—APPARATUS FOR UNDULATORY MOVEMENTS.

It is with such instruments as these that the movements of earthquakes are recorded. In the interests of science, it is to be regretted that more such stations do not exist. For some days before the earthquake in Ischia in 1883, the apparatus in the Vesuvius observatory was continually excited, but owing to our imperfect knowledge no prediction was possible. The establishment of more such stations may lead to the possibility of predicting these disasters.

Fig. 5.—U TUBE OF UNDULATORY SEISMOGRAPH.

On the same day that brought the cable accounts of the disaster, a full account was received of the great eruption of Mauna Loa, in Hawaii. This occurred last January, and was of great interest, and was accompanied with heavy earthquakes. If the theory of earthquakes ever assumes a tangible shape, some connection between distant disturbances may be traced.*

THE VESUVIUS OBSERVATORY.

Famous Earthquakes.

The following is a list of the principal earthquakes that have taken place since the twelfth century, with the casualties caused :

Year. Place.	*Persons killed.*
1137—Sicily	15,000
1158—Syria	20,000
1268—Cilicia	60,000
1456—Naples	40,000
1531—Lisbon	30,000
1626—Naples	70,000
1667—Schmaki	80,000
1692—Jamaica	3,000
1693—Sicily	100,000
1703—Aquila, Italy	5,000
1703—Yeddo, Japan	200,000
1706—The Abruzzi	15,000
1716—Algiers	20,000
1726—Palermo	6,000
1731—Pekin	100,000
1746—Lima and Callao	18,000
1754—Grand Cairo	40,000
1755—Kashan, Persia	40,000
1755—Lisbon	50,000
1759—Syria	20,000
1784—Ezinghian, Asia Minor	5,000
1797—Country between Santa Fe and Panama	40,000
1805—Naples	6,000
1822—Aleppo	20,000
1829—Murcia	6,000
1830—Canton	6,000
1842—Cape Haytien	4,000
1857—Calabria	10,000
1859—Quito	5,000
1860—Mendoza, South America	7,000
1868—Towns in Peru and Ecuador	25,000
1875—San Jose de Cucuta, Colombia	14,000
1881—Scio	4,000
1886—Charleston	96

Lubricant.

A mixture of 100 parts of mineral oil, says *Dingl. Polyt. Journal*, with 25 parts of castor oil, is well mixed with 60 to 70 parts of sulphuric acid, and then worked with 2 or 3 volumes of water. The whole is allowed to stand; the watery layer is then drawn off, and it is then allowed to stand for several days, when it is carefully neutralized with soda or potash. The product is termed "bakusin."

* For additional illustrations and descriptions of seismographs, see SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 455, 488, and 563.

Dried Sewage.

Many attempts have been made to convert sewage sludge into a marketable manurial article, with greater or less success, among other processes being that of separating the liquid from the solid constituents by filtration under pressure. The most recent system of fluid deprivation, and perhaps the most rational one, having regard to the value of the ultimate product, is that of Mr. Astrop, whose system of converting sewage sludge into dry powdered manure was inspected recently by a party of above 200 gentlemen interested in such matters, who were conveyed by special train to Walthamstow, where the works are situate. The works are situate close to the Walthamstow sewage works and farm, and consist of a timber building two stories high. On the ground floor is the driving power, consisting of a 12 horse engine and boiler; part of the desiccating apparatus is also on this floor, but the treatment of the sewage sludge commences on the upper floor. Here is a tank into which the sewage sludge is pumped after it has been chemically treated and deprived of its supernatant water by Mr. Jerram's arrangements in the adjacent sewage works. The tank will contain about 400 gallons of sludge, which is fed into the water extracting machine through a 6 inch pipe, and the supply is regulated by a sluice valve.

The machine, which is about 24 feet in length and 8 feet in width, consists first of a large sludge vat, in which are two hollow perforated metal cylinders, 12 inches diameter, and covered with fine wire gauze having 6,400 meshes per square inch. These cylinders revolve against brushes, which keep the meshes of the wire gauze clear. By means of a pump a partial vacuum is created in these cylinders, and the result is that about 60 per cent of the moisture contained in the sludge is extracted at this point. From this tank the sludge is delivered by a sluice valve on to an endless traveling web of wire gauze of the same mesh as that on the cylinders, the web being as wide as the machine—namely, 8 feet. This web is supported by brass rollers placed at intervals, and passes under two rollers and over two of Korting's exhausters, which remove another 10 per cent of the moisture. The sludge has now assumed the consistency of a thick paste, and in this condition it is passed between five pairs of rollers furnished with iron scrapers. From the last pair of rollers the semi dried sludge falls into a hopper, whence it is fed into a disintegrating cage on the lower floor, and in which it is finally disintegrated and dried by a blast of warm air, leaving only about 5 per cent of moisture in it. The solid particles of the sewage now assume the form of a coarse powder, which falls through the wire meshes of the disintegrator on to the head of an Archimedean screw running in a long trough, and by which means the powdered manure is delivered into a pit, whence it is packed in bags for the market. The continuity and efficiency of Mr. Astrop's system were satisfactorily demonstrated to those present, and it was stated that the resulting powder possesses a high manurial value. The process is certainly simple and effective, and if the commercial results of the use of the manure prove successful—and there appears to be no reason why they should not—the process would seem to offer a satisfactory solution of the sewage question under certain conditions.—*London Times.*

Quince Cider.

A very pleasant beverage can be produced as follows: Take a quantity of ripe quinces, cut into quarters and with the pips, etc., removed. Boil these in a copper with double their weight of water; when boiled to perfect softness, pour the must into a vat. To this add, for every fifty pints of must, two pounds of sugar and half a pound of yeast, diluted in a sufficiency of hot water. Mix the whole well together, and allow to ferment. Then strain and bottle.

SOME FINE OLD CARRIAGES.

The Cluny Museum of National Antiquities, in Paris, France, contains some fine specimens of the work of carriage makers of a period dating back at least as far as the commencement of the last century. These old carriages, some of the most noteworthy of which are represented in the accompanying illustrations, are still in a perfect state of preservation, and afford striking evidence of the skill and taste of the artisans of that early period.

ITALIAN STATE CARRIAGE, 1710-1725.

The Italian carriage here shown is styled a gala chariot, and is designated by a French artist as a *voiture a l'Anglaise*. The springs are of English manufacture, having upon them the stamp of a London maker. The panels are painted with symbolical figures of Literature, Science, and Art. The design and ornamentation are throughout pretty and graceful, but the vehicle has an amount of work put upon every detail which one will look for in vain in the carriage maker's productions of to-day.

FRENCH SEDAN CHAIR, 1700.

In the French state carriage the apparent heaviness of the frame is the most noticeable characteristic. It is almost wholly of wood, the least possible quantity of metal being used in its construction. The body rests in Berlin fashion on a double perch, between the poles of which are long leathern straps, curling over wheels with great circular plates, all notched and gilded, by which means the straps are tightened or loosened at pleasure. The panels are painted with mythological subjects on an aventurine ground. An extraordinary effect of lightness is given by the brilliant coloring of the paintings and the ribbons which adorn the unoccupied space, as well as by the complete framing of the body of the coach, with its windows and doors, in gilded foliage.

Several specimens of the Sedan chair of an early period are to be seen at the Museum, one dating from the period of Louis XV. being represented herewith. It is richly adorned on either side with landscapes on a gold ground, and in front with armorial bearings.

The amount of money lavished on the carriages of the wealthy and high born, in the sixteenth and seventeenth centuries, before carriages came into general use, was sometimes enormous. Italy was especially notorious in this line. A state coach, built in 1629, for the marriage of Eduardo Farnese with Margarita of Tuscany, kept twenty-five silversmiths at work for two years, and shone with some 2,500 ounces of silver.

This suggests the carriage which the Sultan of Turkey had built in 1860, for one of his wives, which was made as far as possible of silver, and cost $60,000. In Italy, artists of note were employed to paint the panels, Pontormo, in 1516, having painted two triumphant cars for Leo X. with mythological scenes. These earlier carriages were, however, not to be compared, as serviceable vehicles, with those built toward the end of the seventeenth century, of which our illustrations furnish some of the best examples now in existence.

FRENCH STATE CARRIAGE, 1710-1725.

Persian Rugs.

"Persian rugs are all made by hand, without a single exception. They are stretched on frames as one would make a sampler, and all the family work on them. A pattern for that particular carpet is before them, which they follow with more or less precision, according as their fancy suits them. As a rule, considerable license is allowed for the expression of individual taste in working out these patterns. No two carpets are therefore exactly alike, and the owner of an old Persian rug may be reasonably sure that while he may find other rugs resembling his, not one that is absolutely identical exists. This quality gives them a value similar to that possessed by an oil painting."

The Persian Government has interdicted the use of aniline dyes, which threatened at one time to ruin the soft harmonious tints of the product of the Persian loom. The rugs of Turkestan (mistakenly called Bokhara rugs) are dyed with aniline frequently, since Turkestan is now under Russian instead of Persian control; and the introduction of machine methods and exact reproductions into Sultanabad in Turkestan, which has recently taken place, may prove a death blow to this peculiar industrial art. There is one kind of rug made in Persia which never leaves that country, on account of its great weight and bulk and consequent cost of transportation. This is a kind of carpet felt, called namads. The ground is made first, the design being beaten in with mallets on one surface only. Another rug which rarely reaches Europe is the "ghilleem," made wholly or partly of cotton. The rich colors are imperishable, and the rug can be washed like a piece of calico. The so-called silk rugs are used almost entirely for hangings. They are rare, and of course very costly. One lies before the peacock throne of the Shah.

Natural History Notes.

Chemical Action of Plant Life.—In a recent number of *Nature*, Prof. Klebs describes an interesting lecture experiment, which illustrates the chemical functions performed by plants. He states that the capability of algæ to render the water in which they live alkaline during the fixation of carbon by them under the influence of light may be easily demonstrated by the addition of a little phenolphthalein solution.

As the fixation proceeds, the water gradually assumes a deep red tinge, which as gradually disappears again when light is excluded. The explanation offered is that the algæ not only take up any free carbonic acid that may be present absorbed in the water, but decompose any acid carbonates that may be within reach. In darkness, the reverse takes place.

Preservation of Plants in Alcohol.—Many plants assume a brown color when placed in alcohol for preservation, and to prevent this change Professor De Vries, of Amsterdam, proposes (*Nature*) to add 2 parts of ordinary hydrochloric acid to every 100 parts of alcohol. Parts of plants brought into this liquid while yet living become absolutely colorless, or nearly so, after the alcohol has been sufficiently often renewed. Such parts as are already brown usually retain their color. By this method colorless specimens may be made of such plants as *Orobanche* and *Monotropa*, which, when treated in the ordinary manner, always become of a dark brown tint. There are only some species with coriaceous leaves that cannot be treated with success with the acid alcohol. Colorless specimens of these must be made by plunging them into boiling alcohol. Professor De Vries has found the proportion of acid above stated to be best suited for the purpose, and specimens may remain for months, perhaps forever, in the acid alcohol without injury. The alcohol, after having been used, may be decolorized by distillation after neutralization with ammonia or carbonate of soda.

The Leap of the Salmon.—The power that the salmon possesses of ascending waterfalls is the subject of some interesting details by Prof. A. Landmark, director in chief of the Norwegian fisheries. He states that in certain cases salmon have been observed to ascend to a distance of 16 feet, and he feels this to be true from having seen them leap over two masts which were 3½ feet apart, and which had been placed across the river at about 16 feet above water, at Hollefoss, upon the Drams, at Haugsend. He says, even, that certain salmon, on ascending a vertical fall, are capable, if they meet the fall at right angles with the muzzle, of remaining a minute or two in the midst of the mass of falling water, if they do not succeed in passing over the fall at a single leap.

Fruit Development.—The cause of the fertility produced in fruit trees by bending the twigs at an acute angle has been investigated by Prof. Sorauer. He finds that the bark on the lower surface of the twig, below the bend, is thrown into transverse folds, here and there detached from the wood. New woody tissue is formed in these cavities, which is filled with starch grains, and after this there is a formation of new woody tissue of a normal character, but always thicker there than elsewhere, and especially on the convex upper surface. The mass of woody tissue checks the flow of water toward the tip of the branch, to the great advantage of the bud directly beneath, which is thus more likely to develop as a fruit bud.

Edible Fungi.—In the Students' Society for Natural Sciences at Upsala, Herr C. T. Morner has contributed a careful analysis of the following edible fungi, viz.: *Agaricus campestris, Lycoperdon bovista, A. procerus, Morchella esculenta, Boletus edulis, B. scaber, Lactarius deliciosus, Hydnum repandum, L. torminosus, H. imbricatum, Cantharellus cibarius, B. luteus, Sparassis crispa*, and *Polyporus ovinus*. The above order represents the relative proportion of *digestible* albuminoids, varying from 22·3 per cent of the dried substance in the first to 3·1 per cent in the last. But, in addition to this, there is a large quantity of *indigestible* albuminoids, amounting to as much as 16·7 per cent in *Lycoperdon bovista*, and 11·8 per cent in *Morchella esculenta*, and in many cases exceeding the amount of digestible nitrogenous constituents. Other nitrogenous constituents not of an albuminoid character—ammonium salts, amido-acids, etc.—are also invariably present, though usually in smaller quantities, the nitrogen in them representing from 0·21 to 2·49 per cent of the total dry weight of the fungus. The total result of these investigations is materially to reduce below the amount hitherto supposed the proportion of digestible constituents in edible fungi, and consequently their value as articles of food.

The writer further states that a hen's egg corresponds, in nutritive value, to 0·28 kgr. of *Agaricus campestris*, 0·73 of *Lactarius deliciosus*, 1·30 of *Cantharellus cibarius*, and 2·05 kgr. of *Polyporus ovinus*; 1 kgr. of beef contains as much nutriment as 9·3 kgr. of *Agaricus campestris*, 15·2 of *Morchella esculenta*, 24·2 of *Lactarius deliciosus*, 41·6 of *Cantharellus cibarius*, and 67·0 of *Polyporus ovinus*. The daily requirements of the body in digestible albuminoids (130 gr.) would be furnished by 5·7 kgr. of *Agaricus campestris*, 6·9 of *A. procerus*, 9·9 of *Boletus edulis*, 14·7 of *Lactarius deliciosus*, 26·3 of *Cantharellus cibarius*, and 41·6 of *Polyporus ovinus*.

The American Water Weed is the name applied in England to our small aquatic plant, *Anacharis canadensis*. This plant, after its introduction into Europe a few years ago, found itself so much at home that it began to choke up streams and lakes and make itself a nuisance to those who delight in boating. Dr. Barnes, of Hanover, now contends that it is not only not an unmixed evil, but an extremely valuable plant, since it destroys the germs of malaria and dysentery; and he recommends that it be introduced into waters where it does not already exist. He says that fish are always healthier where the plant abounds.

Modification of Plants by Climate.—Mr. Crozier, of Michigan University, in a paper on this subject, sums up his conclusions as follows:

"As plants move from the locality of their largest development toward their northern limit of growth, they become dwarfed in habit, are rendered more fruitful, and all parts become more highly colored. Their comparative leaf surface is often increased, their form modified, and their composition changed. Their period of growth is also shortened, and they are enabled to develop at a lower temperature."

A One Hundred and Forty-five Horse Power Whale.

Sir William Turner, the eminent Professor of Anatomy in the University of Edinburgh, recently delivered a lecture to the members of the Philosophical Institution of that city on "Whales, their Structure and Habits," in the course of which he referred to a point of considerable interest to engineers, which was the horse power exerted by the tail of a large whale. Regarding the length of full grown whales, Professor Turner remarked that the porpoise was 4 ft. or 5 ft. long, whereas the Greenland right whale was from 50 ft. to 60 ft. long, and he said that the great finner whale, which frequently visited the British seas, reached the length of 80 ft., or even more. An animal of the latter sort was stranded at Longniddry some years ago. After speaking at some length on the structure of whales, the lecturer made some remarks on the rate of speed at which they traveled. It had been estimated, he said, that the Greenland whale could attain a speed of nine or ten miles an hour, and that the finner whales attained even a greater speed. In all probability the Longniddry whale could propel itself through the water at the rate of twelve miles an hour, and the sperm whale was said to be capable of driving itself along at the same rate of speed. He had asked Mr. John Henderson, of Glasgow, the well-known builder of the Anchor liners, to assist him in arriving at the horse power which must be exercised by one of these great whales so as to acquire a speed of twelve miles an hour, and he put the case of the Longniddry whale before him. It was 80 ft. long, weighed about 74 tons, and had a tail 18 ft. to 20 ft. across from the extreme ends of its flanges. With these data Mr. Henderson calculated that a whale of the dimensions mentioned, in order to attain a speed of twelve miles an hour, would require to exercise a propelling force of 145 horse power.

The Effect of Strong Light upon the Eye.

The exposure of the eye to intense light has been attended with many curious and unfortunate results. In the case of Professor J. Plateau, of the University of Ghent, who while trying to observe the effects of irritation of the retina gazed steadily at the sun for twenty seconds, a chronic irido-choroiditis developed, which ended eventually in total blindness. Dr. J. A. Andrews, in an article upon this subject (*Trans. of Amer. Ophthalmol. Soc.*, 1886), collects a number of cases in which choroiditis and retinitis occurred in persons who had observed an eclipse of the sun. The single flash of a sun reflector has been known to cause retinitis. Scotomata, amblyopia, and other temporary visual disturbances of a functional character have been frequently noted. M. Reich has described a curious epidemic of snow blindness which occurred among a body of laborers engaged in clearing a way through masses of snow which obstructed the road between Passanaur and Mleti, in the Caucasus. The rays of the sun, reflected from the vast stretches of snow on every side, produced an intense glare of light, which the unaccustomed eye could not support without the protection of dark glasses.

A few of the sturdiest among the laborers were able to work with impunity, but the majority, and especially the weakly and anæmic, suffered severely in their eyes, in spite of the various devices to protect them from the light. Among seventy strongly marked cases, thirty were so severe that the men were absolutely unable to continue their work or to find their way home. They were collected in a covered place, where Reich found them on his arrival prone on their faces, striving to hide their eyes from the light, and crying out from pain. Photophobia was present in all the cases. Hyperæmia of the conjunctiva, with more or less injection of the ciliary vessels, and even chemosis, was found in all severe cases. Recovery was gradual, but complete.

Dr. W. C. Rockliffe (*Ophthal. Rev.*, September, 1882, quoted by Dr. Andrews) records a case of acute conjunctivitis brought on by exposure of the eyes to a 3,000 candle power electric light. Dr. Emrys-Jones and Dr. David Little have both reported instances showing that workmen or others who expose the naked eye to an arc light of great intensity are liable to have conjunctivitis, as well as more serious ocular disturbances. It is estimated that exposure of the naked eye for one minute to an arc light of 2,000 candles will cause conjunctivitis. The violet or orange lights are said to be less injurious than the normal white light.

The light of lightning is too transient to cause any injury from simple retinal over-irritation; but it is known that cataracts sometimes follow lightning strokes, and these are believed to be produced by some physico-chemical influence.

Glass blowers suffer from an opacity of the lens brought on, not by the light, but the intense radiant heat (148° F.) to which they are exposed during their work. Dr. Andrews found such opacities in 4·5 per cent of men under thirty-eight years of age, and 20 per cent in men above that age. Dr. Meyhoefer found 9 per cent among men under forty.

Of all forms of artificial illumination, the incandescent electric light, so far as facts now go, is the best. Among 1,100 persons who worked by this light, Dr. Andrews found not a single case of injury. On the other hand, many persons testified to the fact that they could work longer by it with less fatigue than with the gas or oil light. This is due, it is found, to the steadiness, absence of heat, and perhaps the greater proportion of violet rays. Short-sighted persons are, in particular, benefited by the use of the incandescent lamp.—*Medical Record.*

The Spheroidal State of Water as Seen in Glass Works.

The spheroidal state of water has long formed a favorite object for experimentation by lecturers. It consists in protecting a liquid from contact with a hot surface, by interposing between the two a layer of gaseous molecules. These are supposed to oscillate back and forth, forming a "Crookes layer," and keeping the two separate. The molecules are assumed to enter into the same state in which the rarefied gas in the radiometer or Crookes vacuum tubes exists. The paths of vibration of the molecules are supposed to bear some tangible relation in length to the distance separating the boundary surfaces. Many of the experiments with heated metals or fluids, in which the operator seems to be proof against heat, are founded upon this phenomenon. By having the skin properly protected by a layer of steam or other vapor, hot metals and boiling water will have no effect upon it as long as the protective layer is maintained.

In glass works the spheroidal state of water is sometimes illustrated on a large scale. In making colored glass, such as ruby glass, in which gold is the base of the coloring agent, it is often necessary to remelt the charge. The pot of melted metal is emptied by ladling, and the melted glass is poured into water.

A barrel of water is placed upon the floor near the opening of the pot, and the workman with an iron ladle pours the melted glass into the water. It at once sinks, and, owing to its intense degree of heat, becomes surrounded by an atmosphere or thin layer of steam. The water does not touch it, and hence is but slightly heated. The surface remains quiet, and the depths of the water glow with a diffused red light. After a while the glass cools, the water comes in contact with it and bursts into rapid ebullition. Even this ebullition is less violent than would have been anticipated, owing to the non-conducting power of the glass. As soon as a small thickness becomes cool, it protects the center of the mass.

If a few ladles are emptied into a bucket of water, the effect is far more striking. The red hot glass can be seen lying in a mass, as large as a cocoa nut, quietly at the bottom of the pail. It reminds one of the red hot pellets of magnetic oxide of iron that can be seen under water in the oxygen combustion of iron wire. It is most impressive to see the great lump of glowing glass maintaining its full heat under the comparatively cold water. This state of things may last for a minute or more before the water boils.

PHOTOGRAPHIC NOTES.

Method of Discharging the Yellow Color from Platinum Prints.—The *Photo. News* suggests that the supposed yellow color noticeable in platinotype prints, and recently attributed by some authorities to the action of sulphureted hydrogen on the iron salts, is not actually so, as was recently proved by a series of experiments, where the print was held in strong sulphureted hydrogen gas, and was not in the least affected. The real cause was the turning of the paper itself, which gave the yellow appearance to the whites of the picture.

By immersing the discolored print in a bath of weak chlorine water or a weak acidified solution of bleaching powder, the yellow tint is at once removed, bringing the print back to its original vigor.

A FLORIDA "MULE KILLER" (*Thelyphonus giganteus*).

BY DANIEL C. BEARD.

To any one interested in entomology, a glance at the accompanying illustration will be sufficient to satisfactorily locate the "mule killer" among that interesting intermediate group known as the Thelyphonidæ.

None of the spiders possesses real antennæ. In the scorpions the antennæ appear in the form of pincers; in the spider they are transformed into horrid, poisonous, jaw-like organs, instead of the harmless feelers seen on the heads of lobsters, beetles, moths, and butterflies.

The antennæ of the whip scorpion, like the spider's, are changed to venomous fangs or chelicerae, which, in this case, take the form of large prehensile claws, and remind one of a crab or scorpion.

The most remarkable part of the anatomy of the whip scorpion, however, is the structure of the anterior pair of legs, which are much thinner than the other three pairs. The fore feet are formed of a great number of joints, so that the front limbs are converted into flexible organs of touch. Here we see a creature whose antennæ are changed into poisonous jaw-like claws, and the fore legs transformed to antennæ or feelers.

The name whip scorpion comes from the peculiar caudal appendage resembling a whip lash, which can be moved about at the will of the owner. The abdomen is distinctly ringed, after the manner of a scorpion.

The animal is nocturnal in its habits, hiding under chips, etc., but is very active and pugnacious. When kept in captivity, it will greedily devour horse flies and small bugs.

Amid the tangled underwood in the dark damp, re-

WHIP SCORPION (*Thelyphonus giganteus*).

cesses of the Florida forests, along with many other curious, horrid, or beautiful creatures beneath the mouldy leaf or bit of bark, the mule killer lurks during the day, awaiting with the owls the grateful twilight, when it can wander forth in search of crickets, flies, bugs, and other defenseless insects, which it seizes and greedily devours. It sometimes happens that a planter riding through the wood disturbs the "mule killer," and sadly rues the day he did so.

According to the following stories, this little animal is well equipped for the battle of life:

Some road makers had occasion to go into camp at night, and hardly had they comfortably rolled themselves in their blankets before one of them gave a scream of pain. His companions quickly came to his assistance. A light was speedily procured, when a large whip scorpion was discovered in the poor fellow's blanket. Although this incident happened some years ago, the sufferer has never fully recovered from the effects of the poison, and it is said that he is still a helpless invalid. The illustration accompanying this article was made from this identical whip scorpion, now quite harmless, owing to its long sojourn in a bottle of spirits.

Another party of road builders were at work during a spell of cold weather on the Anclote. One of the party, returning to camp after a hard ride, picked up a blanket and buckled it around his sweating mule, to prevent the animal taking cold, but the poor mule caught something worse in the blanket, and commenced to kick, rear, and plunge, finally rolling upon the ground in agony. As quickly as possible the blanket was removed, disclosing a brown object, about 2½ inches long, hanging by a pair of prehensile claws to the mule's back—it was a mule killer, and the mule was dead within an hour.

Near the same place, under very similar circumstances, a horse was lost.

A gentleman well known along the Florida coast as a cattle buyer, while riding a young mare through the "flat woods," had occasion to cross a swampy bit of ground, known in local parlance as a "palmetto bog head." He had not proceeded far before his mare began to kick frantically. Fearing that she had been bitten by a snake, the rider hastily dismounted and discovered a "mule killer" sticking fast to his mare's hind leg, just above the hoof. In this case also the poison is said to have proved fatal within an hour or two.

There are many stories afloat relating the fatal effects from this ill omened, but interesting, animal's bite, some of which add man to the list of its victims.

Poivrette—a New Adulteration of Pepper.

BY PROF. J. CAMPBELL BROWN, D.SC.

The substance known in the pepper trade as "poivrette," or "pepperette," is now so frequently used for the purpose of "fraudulently increasing the weight and bulk" of commercial pepper, that the members of this society ought never to omit a careful search for it in all samples of pepper officially submitted to them. As many commercial analysts do not appear to be yet familiar with poivrette, and as some public analysts have applied to me for specimens, a short account of it may be of use to the society. It made its first appearance in Liverpool last summer, when more than one wholesale pepper merchant brought me samples and inquired what the substance was, and what were its properties. During the last three months I have met with it in between twenty and thirty retail samples of pepper.

Poivrette is a pale, slightly buff or cream colored powder, resembling in the bulk the principal middle layers of the pepper berry, when ground; and when mixed with pepper cannot be distinguished by the eye, nor even by the hand lens, from particles of pepper. In the earlier samples the coarser particles could be isolated by spreading the pepper on a stiff sheet of paper, held in a nearly, but not quite, horizontal position. On tapping this with the finger tips, so as to make the larger particles jump gradually to the lower edge of the sheet, the poivrette particles could then be picked out, and easily distinguished from pepper by crushing them between the teeth. Recently, however, it has been so finely ground and sifted that it cannot always be partly separated in this way, although the toughness and hardness of the particles can always be distinguished by the teeth in a mixture.

Microscopic examination, with a one-sixth or one-eighth objective, shows that it consists of pale dense ligneous cells, some entire and marked with linear air spaces, some torn and indistinct.

The stones of olives, imported in pickle for table use, gave 3·68 per cent of ash, but well washed olive stones, thoroughly burnt to a white ash, gave under 2 per cent of ash-like poivrette. "White poivrette" is therefore cleaned very pale, and perhaps partly bleached olive stones, or precisely similar tissue; black poivrette is the same, mixed with a little black husk. It is to be noted that, although it contains no starch, yet it yields some sugar to Fehling's solution, after being boiled for some time with dilute hydrochloric acid. The quantity depends on the length of time and strength of acid, but may be stated approximately about 10 per cent. It is important to bear this fact in mind when making a full chemical analysis of pepper containing poivrette. After removing from such a mixture the matters soluble by boiling in dilute caustic alkali, the woody fiber which remains has a yellow color; it consists of the poivrette and some of the cells of pepper husk and one of the subcortical layers of the pepper berry. The pepper cells are made lighter, and the poivrette cells darker by the alkali, so that the two are more nearly of a similar yellow color after treatment with alkali. This renders it more difficult to distinguish such of the cells as have somewhat similar markings; but it enables us to distinguish more clearly, as poivrette, the many torn particles which have no definite form or markings. The final examination of the complete cells is better made with good daylight rather than with artificial light, and in a portion which has been treated with water only.

The pepper cells are mostly different in shape, and are colored, and have generally a dark substance in the interior. They are not numerous, but the quantity varies in commercial samples, owing to the modern practice of decorticating the pepper berry to every different extent possible, and mixing the various portions so obtained, including husks, in every variety of proportion with each other or with ordinary pepper. Each individual analyst must make himself familiar with both kinds of cells, as no description can convey an adequate idea of either.—*The Analyst.*

Early Date of Some of Capt. Ericsson's Inventions.

Capt. Ericsson's secretary, in answer to a published statement that the Destroyer is taken from ideas published in the *Army and Navy Journal* in 1863 or 1864, writes to the *Daily News* of New York as follows:

"Captain Ericsson, in September, 1854, submitted to Emperor Napoleon his system of expelling projectiles from submarine guns for the purpose of destroying ships of war. The Emperor promptly acknowledged the receipt of the plans in very flattering terms.

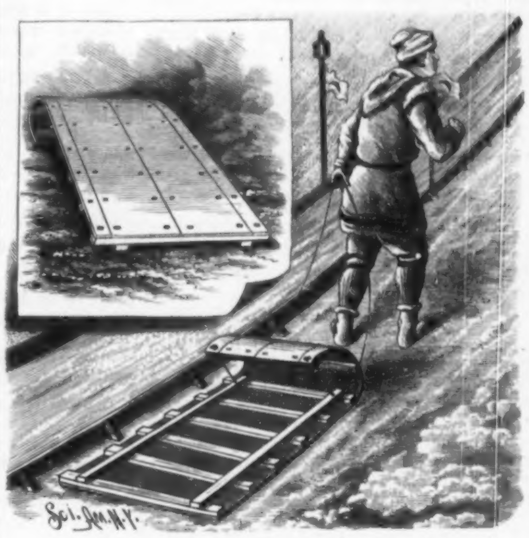
"Regarding the revolving turret, Captain Ericsson has published elaborate illustrations (see *The Century*, December, 1885), showing that the device is very old, and that Abraham Bloodgood of this State, in the year 1807, designed a floating tower armed with a battery of revolving cannon, Timby's revolving tower being a palpable plagiarism of Bloodgood's invention. It will be seen also by reference to *The Century* of the date mentioned that Ericsson studied the system of revolving cannon more than sixty years ago.

"Regarding the screw propeller, it suffices to state that Captain Ericsson obtained a patent in England for this invention, 1836, and that Mr. Petit Smith simultaneously obtained a patent for propelling vessels by a modification of the Archimedean screw. These rival methods of propelling vessels, in a practical point of view essentially different, have been much discussed among English engineers, but Captain Ericsson having successfully applied as early as 1842 his propeller to the American screw frigate Princeton, his claims cannot be disputed. Indeed, *The London Mechanics' Magazine* said a long time ago, 'The undivided honor of having built the first practical screw steamer belongs to John Ericsson.'

S. W. TAYLOR."

A CHEESE BOX TOBOGGAN.

We illustrate in the cut a toboggan made of such primitive material as cheese boxes. These boxes are made of oak or other hard wood. Of this a thin piece, from one-eighth to one-quarter of an inch in thickness, and about five feet long, is bent around in a circle, and is provided with a bottom and cover. To make the toboggan, one or two such boxes are required. A single large box affords material for a small one. The selection should be made with a view to procuring one of the thickest that is attainable. Its bottom is removed, and all nails carefully extracted. It is then gradually



A CHEESE BOX TOBOGGAN.

straightened out. No steaming is necessary. A strip of board is placed across one end, and is nailed outside of the edges of the piece to the floor. This gives a starting point. The curved board is straightened out and secured by other transverse pieces. For a week or more it is well to leave it thus extended. Undoubtedly a good soaking with hot water would help the process along. One end is left bent, the straightening process only being applied to four-fifths of its length.

The thin board thus procured is fitted with cross battens and side rails, as shown. A cross batten is required every six inches. They are three-quarters of an inch square, and are cut so as to project about an inch beyond the board. On top of these the side rails, a trifle heavier, and with rounded corners, rest. The outside of the rails is on a line with the edges of the board. These parts are secured by screws that enter from below, go through the board and cross battens, and enter the side rail. The holes for these must be carefully bored and countersunk in the bottom board. One screw goes through each intersection of batten and side rail. No intermediate ones are necessary if the bottom is in one piece. The weak part of such a toboggan is its side edges. To fortify these an extra piece, about an inch wide, is screwed to the projecting ends of the battens. If anything happens to this, it is easily replaced. The front is battened, as shown, and drawn back and down as far as desired, and secured with wire or cord.

The extra side pieces may be made from another cheese box, or may be heavy hoops. They should be a little thicker than the rest. As shown in the cut, the bottom board is in two pieces. This presents some advantages, especially as regards warping. It, also, is not easy to find a cheese box wide enough. If made thus, care must be taken to see that both halves are of precisely the same thickness. Screws will be required along the inner edges running into the battens. The outer skin may be smoothed with a piece of pumice stone, washed, dried, and rubbed up with beeswax. The only care necessary is never to leave the toboggan on damp ground, as it warps badly under such circumstances.

ENGINEERING INVENTIONS.

A car axle has been patented by Mr. Isaac W. Lewis, of Portland, Oregon. It is a two part axle, the shell having projections on its inner surface near one end, a spindle fitting in the shell having projections breaking joints with those of the shell, and a filling of soft metal being used, making an axle which permits one wheel to revolve independently of the other.

A steam engine has been patented by Mr. Charles F. Chandler, of Newark, N. J. The steam cylinder has two pistons, which advance toward and recede from each other, there being a rotary valve in the steam chest, pitmen connected with crank arms placed at angles to each other on the main shaft, and reversing gear for the rotary valve, the steam being applied in such manner as to avoid dead centers.

A governor for controlling the supply of fluids has been patented by Messrs. Alpheus and Joseph Darling, of Petrolia, Pa. This invention relates to governors used to regulate the supply of gaseous fuel to steam boilers, or to regulate the pressure of steam or other fluids at a point of delivery, and provides novel features of construction and combination to make such a governor that will be simple, efficient, and durable.

A car coupling has been patented by Mr. John T. Pope, of Missionary, Miss. Combined with a pivoted drawbar and a shaft having a ratchet wheel is a pivoted pawl, with one end arranged to engage the ratchet, and the opposite end extended in position to be engaged by the drawbar on an approaching car, whereby cars will be automatically coupled on coming together, and may be uncoupled without going between the platforms.

An electric railway signal has been patented by Mr. Edward D. Wells, of Westminster, Md. This invention contemplates dividing the line, as in the block system, with electrical connections whereby a train is automatically signaled and prevented from entering upon a section of track until it is cleared, and provides a peculiar construction and arrangement of the circuit and signaling mechanism, which is also equally applicable as a switch signal.

MECHANICAL INVENTION.

A drilling machine has been patented by Messrs. Edgar Allen and Daniel S. Henrie, of Three Rivers, Mich. The construction is such that the drill spindle carries the drill in yielding connection with the material to be operated upon, and so that the pressure may be varied as required, the invention covering novel features of construction and combination for attaining these ends.

AGRICULTURAL INVENTION.

An adjustable plow shovel has been patented by Messrs. Amos B. Root and James F. Youtz, of Mount Joy, Pa. The curved standard has a pivot and adjusting apertures at its upper end and a vertical socket at its lower end, a transverse screw extending into the socket, and a bracket with vertical shank having an annular groove into which the set screw enters, to hold the shank from horizontal or vertical movement.

MISCELLANEOUS INVENTIONS.

A gate has been patented by Mr. John B. Holton, of Washington, Ky. The main feature of this improvement consists in a right-angular hinge rod, in connection with a special construction and combination of parts whereby the gate is braced, adjusted for taking up sag, and attached to the pivot post, the invention pertaining especially to farm gates.

A crock carrier has been patented by Mr. George K. Schauer, of Osborn, Ohio. It consists of a pair of levers crossed and pivoted together, and having angled serrated jaws, the longer arms of the levers being bent inwardly toward each other and having an elastic ball by which the jaws are drawn together in lifting two crocks thus held and lifted together.

A chimney cowl has been patented by Mr. Christian W. Ackermann, of Streator, Ill. The conical cap of the cowl is provided with a series of hinged pendants, and there are various novel details of construction calculated to give good ventilation to a room and yet automatically prevent rain or snow from blowing into the chimney.

A sofa bed has been patented by Mr. Lionel S. Trotter, of Portsmouth, Ohio. This invention covers a novel construction and combination of parts in a class of beds adapted to be folded for use as a sofa or chair, and provides a simple and inexpensive bed of this character, in which provision is made for the concealment of the bedclothes within the frame.

A faucet has been patented by Mr. Charles H. Loper, of Hickory, N. C. Combined with a bushing is a sliding tube having the inner walls of its outer end beveled, with other novel features, whereby the faucet can be pushed inside the barrel to be completely out of the way, to facilitate quickly moving the barrel without removing the faucet.

An electric burglar alarm has been patented by Mr. Edward E. Carr, of Chalmers, Ind. This invention consists in the peculiar arrangement of the circuit and contacts, and the means for locating the break, being applicable with a single battery to the doors and windows of dwellings, barns, etc., for sounding a continuous alarm.

A fruit picker has been patented by Mr. Jesse R. Hunter, of Palatka, Fla. It has an arm with stem-supporting shoulder and operating lever, with a spring wire secured at one end of the arm, connected to a cutting blade, and formed between its ends with a loop, in which the fruit is received after its stem is cut.

A neckscarf has been patented by Mr. Rubin Barnhard, of New York City. It is made to carry a picture, which can be exhibited or screened at the will of the wearer, the scarf having an opening in front, back of which the picture is adjustably held, ordinarily hidden from view, but so that it may be exhibited by the wearer pulling upon a band.

A dental anodyne or local anæsthetic has been patented by Mr. Robert H. Peak, of Orlando, Fla. It consists of a neutral mixture of acetic acid and carbonate of ammonia, salicylic acid, and hydrochlorate of cocaine, to be used for preventing or relieving pain during any work the dentist may have to do on the teeth.

A method of decorating glass has been patented by Louisa Winterhoff, of Hammersmith, London, England. A picture or design is printed on transfer paper, which is dampened and applied to the glass, printed side in contact, the paper then being moistened and stripped from the glass, and the printed impression dusted with finely powdered resinous substance.

A clamp has been patented by Mr. Frederick F. Houston, of Chicago, Ill. This invention covers novel features of construction and arrangement of parts, and an arrangement of a series of clamps on a frame for effect on all four sides of framed work at once, being especially designed for the use of carpenters, cabinet makers, and woodworkers in general, while clamping or gluing their work.

A tent has been patented by Mr. Merritt P. McKoon, of El Cajon, Cal. It is an improved "A" tent, with its ends firmly closed and extended at bottom into a half diamond shape, the doorway being at the center of one of the sides, with an inverted V-shaped canvas over the doorway, from the front peak of which is a guy rope passing over a suitable support for holding the roof straight out and firm.

A wire covering machine has been patented by Mr. Daniel Macduff, of North Grafton, Mass. The object of the invention is to make a machine especially adapted to produce a very pliable metallic thread for sewing leather or for other purposes, and it consists of a device for corrugating the wires before covering them with linen or other material, and means for winding the thread around the corrugated wires.

A book adjuster has been patented by Mr. Irvine J. Adair, of Dallas, Tex. It consists of a holder having longitudinal recess and vertical screw-threaded aperture, with base piece, adjusting screw, spring catch, and other novel features, for leveling books, especially large and heavy account books, and holding the leaves open, and enabling the book to be closed and opened again at the same place.

A folding baby carriage has been patented by Mr. Charles Haller, of New York City. It is so made that an elastic support is provided for the rear end of the carriage body, so that the elasticity of the spring can be regulated, and so that the carriage can be used as a cradle, with other novel features, the invention being an improvement on a former patented invention of the same inventor.

A measuring rack for goods in the piece has been patented by Messrs. William C. Newton and James G. Ferrill, of Batesville, Ark. It consists of a frame in which are side pieces adapted to hold the roll or board carrying the goods in such way as to facilitate the removal of just the quantity of goods required, the rack being designed for both light and heavy fabrics of all widths.

A pocket knife has been patented by Mr. Julius Wiesner, of Manchester, N. H. It is a springless clasp knife, the blade having studs on opposite sides of its shank at diametrically opposite sides of its pivot, the cheek plates having semicircular slots, with other novel features, whereby the blade will be held rigidly in an open or closed position, although the knife has no back spring.

A heating and ventilating apparatus has been patented by Mr. Richard A. Rew, of Pomeroy, Washington Ter. This invention covers a novel construction and combination of parts for providing the heater with plenty of pure air, economizing fuel, properly tempering the heated air by discharging steam into it in any desired quantity, and for drawing off the foul air and admitting pure air to the room.

A repeating fire arm has been patented by Mr. Carl J. Bjerkness, of Arkdale, Wis. The invention consists of a cylinder sliding in the breech block, a firing pin sliding in the cylinder, and a bushing on the breech block, making a repeating arm which is loaded automatically and throws the firing pin back to its place by the back action of the charge, and also discharges the cartridge shell automatically.

A lubricating composition has been patented by Mr. Joseph Plante, of Levis, Quebec, Canada. It consists of powdered sulphur, peat, and oil, the peat being used because it readily remains mixed with the oil, and the sulphur because the sulphurous acid which would be formed therefrom in case of fire would speedily extinguish the fire, the lubricator being designed for car axles and other purposes.

A composition for the manufacture of stone ware, etc., has been patented by Mr. Richard C. Remmey, of Philadelphia, Pa. It consists of Delaware clay and Delaware yellow brick clay, flour of mica, pulverized fine burnt clay, Connecticut brownstone, ground feldspar, and powdered loam, so combined as to be impervious to acids, extremely hard, and stand great changes of temperature without cracking or scaling.

A circular knitting machine has been patented by Mr. Thomas C. Chawner, of New York City. It is intended for working hard twisted yarns, and has special cutting means, in combination with catch lever and block, for automatically severing the yarn with a shears-like cut, with other novel features, the invention being an improvement on a former patented invention of the same inventor.

A tobacco wagon frame has been patented by Mr. Joseph F. Prescott, of Hopson, Ky. It consists of two pairs of longitudinal timbers supported at opposite sides of the wagon by two pairs of trestles consisting of crossed timbers, forming both the supports and braces of the frame, which is inexpensive and rigid, and especially adapted for a wagon for carrying tobacco.

An alarm attachment for door knobs has been patented by Mr. William P. Allison, of Kennebunk, Me. The door knob spindle has levers connected by an intermediate mechanism to a lever centrally pivoted to a support, from which a connection is made with a lever adapted to operate the door bell, so that the act of turning the knob to open the door will sound an alarm.

A picture exhibitor has been patented by Mr. Arthur M. Boos, of Buffalo, N. Y. It is a device of novel construction, superior to the ordinary book albums, and much less cumbersome when viewing the pictures, with side openings and interior catches, and slides to view photographs of various sizes, and may be made of large size, and operated by machinery to display advertisements.

A caster has been patented by Mr. John S. Dignam, of London, Ontario, Canada. It is of the kind in which the cruet-carrying receptacles turn upon a horizontal shaft, a cross piece at the bottom of the base adapting the caster to be attached vertically as in a buffet railway car, with other novel features, the invention being an improvement on a former patented invention of the same inventor.

A trace carrier has been patented by Mr. John L. Gilman, of Des Moines, Iowa. It is applicable for use in connection with either a single or double harness, and so arranged that the ends of the traces may be inserted and securely held against accidental displacement, relieving the stableman of the trouble of doing up the trace to prevent its dragging upon the ground.

A subsidiary axle arm has been patented by Messrs. George Hoepfner and Henry Wuest, of New York City. It is for use on the axle of a vehicle if the original axle becomes broken off, to be attached thereto by clamps, the subsidiary axle being adapted for either end of the main axle, and the invention covering a special construction of the axle and clamps.

A refrigerator has been patented by Mr. William W. Dunn, of Fort Worth, Texas. The cooling box has top doors, and there is an overhanging frame and guide pulleys, with cords and weights, the ice box having an ice support in its lower end and a water tank in the upper end, the discharge pipe being connected with the tank and having its lower portion disposed in coils below the ice support.

A device for renovating garments has been patented by Annie Shanley, of New York City. It consists of a standard with heating shell and heating core, with gas pipe fitted in the shell for heating it when the core is not to be used, with other novel features, whereby the sleeves and shoulders of velvet or other garments may be renovated without ripping or removing from the body of the garment.

An arc lamp has been patented by Messrs. Vaclav Klan and Francis Spurny, of Prague, Austria-Hungary. The carbon holders are suspended from two sets of pulleys, one for balancing the carbons and their holders by their weights as usual, and the other set to maintain equilibrium against the resultant attraction of the two solenoids by a suitably suspended counterpoise, with other novel features.

A thill coupling has been patented by Mr. Joseph Christiff, of Hightstown, N. J. Combined with the thill iron, clip, and bolt connecting them, is a nut having inward beveled sides, and a wedge with one vertical edge beveled to engage the beveled nut and bearing against the clip with its opposite vertical edge, the object being to prevent the rattling of the shaft or thill coupling.

Storing ice forms the subject of a patent issued to Mr. George T. McCormick, of New York City. This invention provides means for dressing or trimming blocks of ice by the power that moves the blocks along the tramway into the ice house, a saw being arranged to run parallel with the tramway and cut off the honeycombed and snow ice from each block, there being also vertically arranged saws or knives to dress the sides of the blocks.

A music leaf turner has been patented by Mr. Seth Rathburn, of Chicago, Ill. It is adapted for use with both organs and pianos, the apparatus being fixed to the face of the music rack, and the music in position, with separate leaves between spring tongues moved by carrying arms, which may be operated either by a treadle or by hand by the performer, without interfering with the performance of the composition.

A flue or chimney lining has been patented by Mr. Hugh McMahan, of New Cumberland, West Va. The flue sections are made with angular cross section, and the interior angles filled in or re-enforced to approximate a round form, the ends being so formed that one end of each section shall have tenons and the other end sockets to fit such tenons, the design adapting itself especially to terra cotta or earthenware flues and chimney linings.

A hay press has been patented by Mr. Charles A. Hamilton, of Meridian, Miss. It is an improvement in that class of presses known as continuous or reversible, the material being fed into the press box in successive charges to be acted on by a reciprocating follower, which is operated by a pivoted reversible sweep or lever, so connected as to permit it to be thrown back by the elasticity of the pressed material after reaching the limit of its forward movement.

A watch regulator has been patented by Mr. Aloys Platt, of Brooklyn, N. Y. The adjusting screw and the regulator lever are so connected that there will be no side play at the point of connection, and the connection is so arranged between the adjusting screw and the lever which moves it that all danger of accidental displacement of the screw, and the regulator lever to which it is attached, is avoided, the invention being an improvement on a former patented invention of the same inventor.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

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(1) **F. E. asks: If a piece of magnetic** iron were dropped from a balloon several miles above the surface of the earth, would the magnetic attraction of the north pole attract the iron, or would it fall in a perpendicular line to the earth? A. Possibly the course of the falling body would be slightly affected by the magnetic attraction, but such pull would be very small compared with that of gravity.

(2) **J. M. asks how to polish bullocks'** horns. A. First scrape with glass to take off any roughness, then use pumicestone powder with a piece of cloth wetted until a smooth face is obtained. Next polish with rottenstone and linseed oil, and finish with a piece of clean linen rag. The more rubbing with the rottenstone and oil, the better the polish.

(3) **K. S. S. asks: Is white clothing** warmer to wear than black? A. For the same material black is warmer in sunshine and white during darkness.

(4) **E. G. desires: 1. Receipt for making** a good cosmetic. A. For black, use good lard 5 parts, wax 2 parts (or hard pomatum 7 parts), melt, stir in levigated ivory black 2 parts, and pour it into moulds of tin foil, which are afterward to be placed in paper sheaths. For white, the same without coloring matter. 2. Bay rum. A. Saturate a ¼ pound block of carbonate of magnesia with oil of bay; pulverize the magnesia, place it in a filter, and pour water through it until the desired quantity is obtained, then add alcohol. The quantity of water and of alcohol employed depends on the desired strength and quality of the bay rum. 3. Brilliantine. A. Take of honey 1 fl. ounce, glycerine ⅜ fl. ounce, cologne ½ fl. ounce, and alcohol 2 fl. ounces. 4. A good razor paste. A. Take of levigated oxide of tin, prepared putty powder 1 ounce, powdered oxalic acid ¼ ounce, powdered gum 20 grains, make into a stiff paste with water, and evenly and thinly spread it over the strop. With very little friction, this paste gives a fine edge to the razor, and its efficiency is still further increased by moistening it.

(5) **S. E. L. asks the best and surest** way to drill holes in chilled iron. A. A moderate chill can only be drilled by the hardest blunt drill with great pressure and very slow speed.

(6) **N. P. K. wants a receipt for tak**ing varnish off of furniture. A. Use a solution of about 3 pounds common washing soda to a gallon of water. Apply this to the work with a common paint brush, and after allowing it to stand for a short time the varnish can be removed with an ordinary stiff scrubbing brush.

(7) **J. C. H. asks how to reduce over**-intense dry plate negatives without the use of potassium oxalate. A. First immerse the negative in a concentrated solution of alum and citric acid (make a 10 ounce saturated solution of alum, let stand for a few hours, and add 1 ounce citric acid). The negative should be left in this solution for a quarter of an hour. If no reducing effect takes place, then wash and immerse the plate in a bath of:

Sulphuric acid	1 oz.
Water	20 oz.

for about the same length of time. The negative will have a grayish color. 2. What is a good formula for ground glass varnish?

A. Sandarac	18 parts.	
Mastic	4	"
Ether	200	"
Benzole	80 to 100	"

3. A good cigar flavor. The following is one of many recipes said to be used in improving inferior qualities of tobacco: Comminute cassia bark, orris root, licorice root, angelica root, and rosewood, each 7 oz. Macerate with 4 gallons of water, press out the liquor, and compound with a solution of 2 pounds of pure saltpeter and 3½ pounds of white sugar in 1½ gallons of water. This mixture is calculated sufficient for treating 100 pounds of leaf tobacco.

(8) **N. M. B. writes: In the shop where** I work, the main shaft pulleys and belts are greatly charged with electricity. Can you tell me the cause of it, and what effect it has on speed of shaft? Does it retard it? If so, is there any remedy for it? A. The electricity generated in belts is presumably due to the bending of the belt and its slight friction on the pulleys. It indicates dry air and a dry belt, and does not noticeably affect the running of the machinery. Moistening the air is the remedy if any is really needed, or a metallic comb with ground connection might be fixed with its teeth close to and pointing toward the belt. The charge can be taken from the shaft and pulley by attaching a wire to the shaft and thence to the water pipe.

(9) **G. B. W. asks how to produce hy**drogen and oxygen cheaply to use for welding purposes. A. You can produce hydrogen by passing steam over ignited iron scrap contained in a "through" retort or one with connections at both ends. By using coal instead of iron you will get a mixture of hydrogen and carbon monoxide that is just as good for your purpose. A very high heat is required. Oxygen can be made by heating chlorate of potash mixed with a quarter its weight of binoxide of manganese to a low red heat, or by heating binoxide of manganese alone to a very high heat. Oxygen has to be used with great care in welding, as it is liable to burn the iron. Superheated air would probably be better and cheaper.

(10) **G. A. C.—See Lowe Gas Process, in** SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 98, 114, 53, and on Water Gas consult SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 60, 303, 398, 311. Use one square foot heating surface in boiler to 8 square feet of radiating surface for ordinary rooms, and one square foot of radiating surface to 100 cubic feet of air in exposed rooms or 120 cubic feet of air in ordinary rooms. The square root of the square root of the heating surface, in feet, in the boiler will give a fair average diameter of the main steam pipe in inches. Proportion the distribution to the radiation according to intervening pipe sizes. No radiator should have steam inlet less than ¾ inch for low steam. Medium and large radiators should have 1 inch and 1¼ inch inlets, one less size outlets; 1 inch pipe is the most suitable for radiators. There is no perceptible difference in the one and two pipe system of radiators.

(11) **B. S. M. Co. asks (1) what receipt** there is for staining wire, or iron or steel, blue. A. The processes are similar for obtaining colors by a stain. Bluing is generally done by heating to obtain the color desired. 2. And brown. A. For browning, wet a piece of rag with antimony chloride, dip it into olive oil, and rub the iron over. In 48 hours it will be covered with a fine coat of rust. Remove this with a scratch brush, and apply oil.

(12) **J. H.—Gun barrels are not case**-hardened. They are blued by heating and mottled by acids. This is a very difficult work, requiring experience and a suitable muffle oven. The browning of gun barrels is a chemical process alone. See answer to preceding query.

(13) **W. G. K. asks: How can I color** copper medals so as to give them the appearance of old bronze? A. Dissolve 30 parts of carbonate or hydrochlorate of ammonium and ten parts each of common salt, cream of tartar, and acetate of copper in 100 parts of acetic acid of moderate concentration or in 200 parts of strong vinegar, and add a little water. When an intimate mixture has been obtained, smear the copper object with it, and let it dry at the ordinary temperature for 24 or 48 hours. At the end of that time the object will be found to be entirely covered with verdigris presenting various tints. Then brush the whole, and especially the reliefs, with a waxed brush, and if necessary set the high reliefs with hematite or chrome yellow or other suitable colors. Light touches with ammonia give a blue color to the green portions, and carbonate of ammonium deepens the color of the parts on which it is laid.

(14) **G. C. F.—The North American** magnetic pole is in about 73¼° north latitude and 96° west longitude, moving west. Its greatest elongation is supposed to be about 33°. As only about ¼ of a revolution of the magnetic pole has been noticed, it is yet uncertain whether it completes a revolution or is only vibratory. It is supposed to occupy the point of most intense cold. What connection the two phenomena have is not yet known. The variation of the needle for New York for 1887 is 8$\frac{1}{10}$° and increasing at the rate of 3 minutes per annum. The Coast Survey have this work in hand, and publish reports of investigations on the subject.

(15) **J. H. V. asks the greatest number** of tons it would be safe to pull up an incline of four inches to the foot with a seven-eighth inch diameter or No. 9 steel wire cable. A. 15 tons.

(16) **G. B. asks a varnish for protecting** fence wire. A. Use well boiled linseed oil, properly laid on; if necessary, color with umber. The iron should be first well cleaned and freed from all dust and dirt; the oil should be of the best quality and well boiled, without litharge or any drier being added. Asphalt varnish or coal tar may be used instead of the above.

(17) **L. F. M.—If an attempt were made** to use the House telephone to talk, the Bell Company would treat it as an infringement of their patent. It will talk if constructed in accordance with the patent. If a microphone transmitter was used with it, the claim of infringement by the Bell Company would be by so much the more ratified.

(18) **J. L. P.—The vacuum system of** propulsion described by you does not take into account the theory of equality of action and reaction. The vessel would, as far as the vacuum is concerned, be pushed as hard backward as forward.

(19) **J. S.—In answer to your question,** how many feet of heating surface is calculated per horse power on a boiler at 60 pounds pressure, the types made us say 150 instead of 15 square feet. The latter figure is large, but is not out of the way in a small plant with such engines as are most frequently used, although with better efficiency the heating surface may be reduced to as low as 6 to 12 square feet per horse power.

(20) **N. S. B. asks: How can I quickly** and inexpensively freeze water in a bottle, what freezing mixture to use, and what sort of an apparatus to employ? A. Nitrate of ammonia and water is one of the best of the simple mixtures. Surround your bottle with the coldest water you can get, held in a nonconducting vessel of wood if possible. Add an equal weight of nitrate of ammonia. Stir well. A second treatment of the chilled bottle may be necessary; or what is better, if you can cool enough water to use as the solvent for the second portion of nitrate of soda, the work will be better done. Probably chopped ice with one-half its weight of salt would be cheaper and better, and two successive applications should effect the result. A mixture of 5 parts nitrate of ammonia, 6 parts sulphate of soda, and 4 parts dilute nitric acid is exceedingly powerful. Use wood as far as possible for the outer vessel, and metal for the inner. Glass will probably break.

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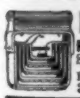

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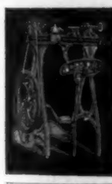

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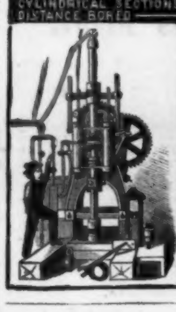

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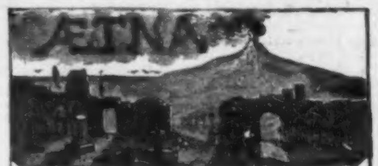

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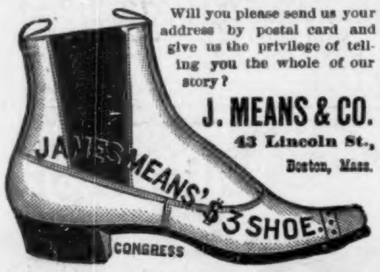

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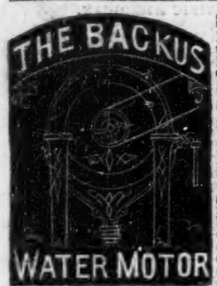

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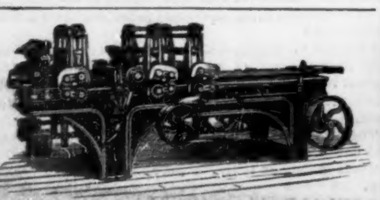

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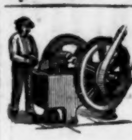

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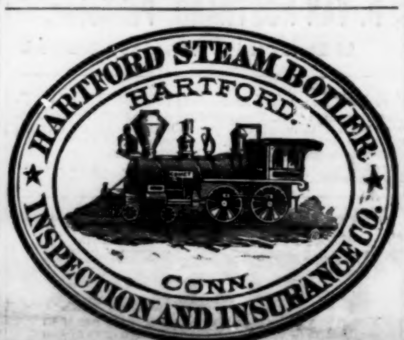

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